

MARCH \* 15 CENTS

SEE PAGE 51

NEW INVENTIONS . MECHANICS . MONEY MAKING IDEAS HOME WORKSHOP PLANS AND HINTS 350 PICTURES



# Gar Wood knows his engines

Miss America X romps over the flying apray at more than two miles a minute. A record is shattered. Gar Wood again shows the world a triumph in speed.

Sixty-eight hundred horse power drove that boat! One thousand firing strokes every second from her motors! There are 48 cylinders and 192 valves.

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# FULL MECHANICAL STORY OF 1934 PLYMOUTH SIX



# Read this Amazing Story... and you'll agree Plymouth is the best engineered car in the Low-price field

What's the big news about the 1984 Plymouth? In a nutshell, simply this: Plymouth is not only a car with new features—it's a whole new car built for better riding!

Plymouth engineers laid the foundation of truly comfortable riding years ago when they perfected Floating Power engine mountings and eliminated engine vibration.

This year they add a "levelized" ride by replacing the usual front

axle with individual wheel springing in even the lowest priced models?

Reserve power has much to do with driving pleasure. So this year's engine is a 77-horsepower six.

The braking system is, of course, hydraulic. But to the smooth, self-equalizing action of this system, Plymouth has added in the De Luxe models . . . still greater efficiency by increasing braking surface one-third.

Bodies on all Plymouth models are

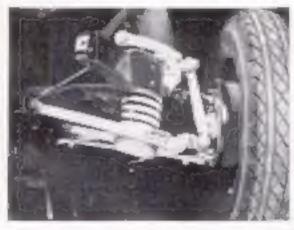


All-Weather Ventilation In De Luxe models.

of modern safety-steel construction. Steel is reinforced with steel for safety — then welded permanently together for long car life with quiet and perfect safety.

Plymouth is the only low-priced car with Floating Power, hydraulic brakes and safety-steel body as well as individual front wheel springing.

See Plymouth at the nearest Dodge, De Soto or Chrysler showroom and you will see the best engineered car of the low-price field.



INDIVIDUAL SPRINGING on the Plymouth is simple, easily accessible, dependable. There is no longer any front axis.



A PRACTICAL TEST of Floating Powers. The engine is racing, the glass of water on the fender does not tremble.

it's the Best Engineered car in

THE LOW-PRICE FIELD

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In This Issue—Hundreds of Fascinating Articles Tell the Latest News of Laboratory Discoveries, Scientific Triumphs, and Amazing New Inventions

# But it's fair and warm



At L outdoors may be frowning, the thermometer close to zero, street travel an exhausting task. Yet to your telephone it is as clear and fair as a day in June.

Without moving from your chair at home or in your office, you can send your voice across the snow-swept miles. Wind and weather need not delay the necessary tasks of business or break the ties between friends and relatives. Through all the days of the year, the telephone is your contact with the world beyond your door. It knows no season—no letting up when the going gets hard. Through storm and flood,

an army of trained employees works ceaselessly along the highways of speech.

This very day, as you talk so easily from the warmth and comfort of your home, a lineman may be scaling a pole far out on a frozen mountainside—so that the service may go on. So that you may talk to almost anyone, anywhere, at any time.

Make someone happy these winter days through a poice visit by telephone. A boy or girl at school, a mother or father in another city, or a good friend away on a visit. To most places 175 miles oway, for example, the rate for a station-to-station call is 95c in the daytime, 45c after 7 P. M., and 55c after 8:30 P. M.

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# Motorists Wise SIMONIZ

KEEPS CARS BEAUTIFUL

# Better than Money

# in the Bank

By Thomas J. V. Cullen

Note: Mr. Cuilen is Editor of THE SPECTATOR, one of the country's leading bisurouse papers. This article was written by him at our special request, for we felt that the interest of Popular Science Readers in the subject of life insurance, and the importance of it in today's financial conditions deserved the attention of a specialist and recognised authority, such as Mr. Culien is.—The Editor.

HERE is an army in this country so large that it exceeds the total of all mobilised troops engaged in the World War by 20,000,000 in numbers? It is the army of people directly concerned with and affected by life insurance.

Policyhoklers alone number 65,000,000—and a conservative estimate of named beneficiaries, exclusive of these policyholders, raises the total to 85,000,000. If this figure is too large to comprehend and digest by keelf, a comparison may make its importance clearer, Savings banks have 40,000,000 depositors; stock and bondholders total 20,000,000.

When any one financial structure can embrace so huge a number of people, when any single investment channel can affect in some way or another seven out of every ten people in this country, its soundness certainly becomes the concern of everyone.

As this article goes to press, the President of the United States is asking his Congress to approve a budget of ten billion dollars. To conceive of this amount as one lump sum of money is practically beyond human imagination or capability. Put in another way, a man would have to live 19.049 years and 52 days and spend a dollar every minute of his superlife to use up ten billion dollars!

Yet, 65,000,000 policyholders have contributed toward building twice that amount—twenty billion dollars—in assets for the combined life insurance companies in this country! Naturally this money in turn has been re-invested by these companies. Today these policyholders have a tremendous stake in every important American industry. Where, specifically, has this money gone? It has supplied the railroads with 29% of all the capital which supports this industry—and the two million people working in it. Policyholders have supplied 14% of all the money behind the bonded indebtedness of one public utility companies. In addition, they hold 4% of all the outstanding Government bonds and 1% of the outstanding obligations of all states, counties and municipalities in the country. They have advanced something like 20% of the farm mortgage loans and 16% of the total mortgage loans on all types of real estate, as well.

That's a great deal of money to hand out. Has it been invested wisely or has it gone up in smoke, like an many other investments made in the last five years? Look at the record. For every day of the three hundred working days in every year since 1929 life insurance companies have paid between seven and ten million dollars to people who benefited by maturity of policies or who were in need of cash on those particular days. One can't begin to visualize how much worse the country's condition might have been during the last four years of depression had it not been for the integrity and assistance of life insurance companies.

IT WILL be seen then that no financial institution has come through the depression with a performance to equal the record of life insurance companies in respect to stability and management. For, as a result of sound management life insurance not only met its every obligation and performed its every function during these last four years, but also it closed its books in December, 1933, with almost four billion dollars more assets and almost two hundred million dollars more surplus funds than were on hand at the end of 1929.

That growth is the result of the consistent confidence which the American people have placed in the financial soundness and good management of life insurance. It has contributed to the ability of life insurance companies to meet their obligations dollar for dollar during the depression without undue stress or impairment of reserves. (Continued on page 8)

Confidented

A HEART-TO-HEART TALK ABOUT YOUR FINANCIAL PROBLEMS



# Your LIFE INSURANCE is your Best Investment

# Hold on to what you have ... add to it when you can



Take a few minutes today and look back over the record of your investments during the last four years. Which has given you the least worry? Which has been affected least by the storms of panic and depression? The chances are that your life insurance policy has had the best record of any investment that you own.

There are good reasons why the record of His insurance has been so outstanding during the four black years of depression.

#### Conservations

The money you invested in your life insurance policy has been reinvested in carefully selected bonds, morrgages and other securities. Although life insurance investment men are not magicians, they are trained specialists in their respective fields. Their investments are conservative, based on safety, soundness and accurity father than possible profits or highly speculative yield.

#### Steady Income

Then, too, life insurance has the advantage of a steady flow of premium and interest

income from all over the country, both in good times and bad. This income makes it unnecessary to eaceifice choice investments for cash.

#### Diversification

Furthermore your life insurance policy represents not one investment but thousands of investments, bucked by ample reserves and supervised by insurance commissioners of the various states. From this apread of sound investments your individual policy gains security and strength.

#### **Speculation Versus Certainty**

Should there be a repetition of the speculative fever of the boom era, there will be a temptation to overlook the steady, consistent safety of life insurance as an investment and to turn toward speculative investments which promise huge profits, quickly made. You will be asked to take a gambler's chance, but do not be misled. Hold fast to that which is good! In good times and bad, your life insurance policy will prove to be the backing of your financial investments, if past experience means anything.

#### Substitution

You may also be advised to switch your life insurance from one company or plan to another on the plen that you can save money. On the contrary, you probably stand to lose money. No matter how attractive the new proposition seems on the surface, investigation usually shows that, dollar for dollar, the life insurance policy you already

nwn is better than the new one because of the fact that the older a policy is, the more valueble it tends to become. Before you authorize anyone to change your life insurance from one permanent form to another, write to the company which issued your policy, or to the insurance commissioner of the state in which you live.

### Your Best Investment

Your life insurance is your best investment. Hold on to what you have and add to it when you can. Naturally, we hope that you will add your next policy in the Provident Mutual, whose record of service and safety has been unsurpassed since its founding in 1865. But whether through Provident Mutual or some other well-established, conservatively managed company, fivest in life insurance. It will pay!

#### A Unique Investment Opportunity

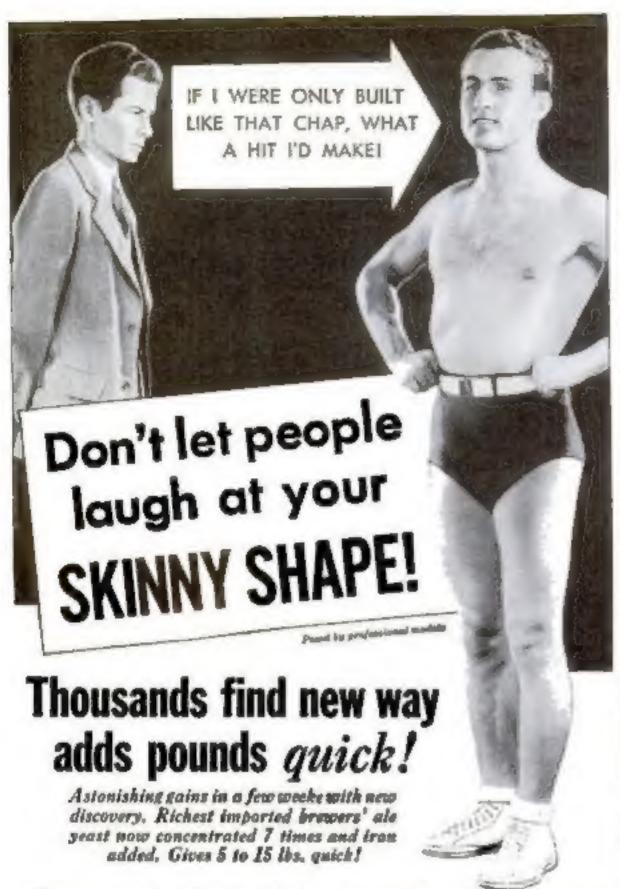
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# PROVIDENT MUTUAL

LIFE INSURANCE COMPANY OF PHILADELPHIA Founded 1865

Conjugated reasons



FOR years doctors have prescribed years to build up health for rundown men and women. But now, thanks to a new acientific discovery, you can get far greater tonic results than with ordinary yeast—regain health, and in addition put on pounds of husky flesh and in a far shorter time.

Not only are thousands quickly gaining solid, good-looking pounds, but also clear, healthy skin, freedom from indigestion and constipution, new pep.

#### Concentrated 7 times

This amusing new product, Ironized Yeast, is made from specially cultured brewers' ale yeast imported from Europe -the richest yeast known—which by a new process is concentrated 7 timesmade 7 limes more powerful.

But that is not all! This marvelous, health-building yeast in then ironized with 8 special kinds of iron which strengthen the blood, add abounding pep.

Day after day, as you take Ironized Yeast, watch ugly, gawky angles fill out, flat chest develop and skinny limbs get huaky. And with this will come a fine, clear, ruddy skin, new robust health to

lick your weight in wildcats-you're an entirely new person.

#### Results guaranteed

No matter how skinny and weak you may be, this marvelous new Ironized Yeast should build you up in a few short weeks as it has thousands. If you are not delighted with the results of the very first package, your money will be in-stantly refunded.

Only be sure you get genuine Ironized Yeast, not some imitation that cannot give the same results. Insist on the gen-size with "IY" stamped on each tablet.

#### Special FREE offer!

To start you building up your health this absolutely FREE offer. Purchase a package of Ironized Yeast at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body," by a well-known authority. Remember, results are guaranteed with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Dept. 453, Atlanta, Ga.

## BETTER THAN MONEY IN THE BANK

(Centimued from page 6)

"That's all very well," a person may say, "but some life insurance companies failed, didn't they." Yes, they did-and since the question is brought up, let's

answer it now.

Nanety-five per cent of the life insurance companies which were actively functioning at the close of 1929 are in operation today, paying all claims in full as they occur. The companies which did fail represent something less than 3' of the total assets and about 11/25; of the total life insurance in force. Certainly that's a spleadid record. Certainly no other branch of our financial structure can stand up to it in a figure-to-figure comparison. If only that small percentage of the banks in this country had gone under in the last four years, there would never have been a bank holiday back in March, 1933. It wouldn't have been necessary.

But remarkable as this record is, even so small a fraction of insolvency should not be allowed to cast any reflection on the entire system of legal reserve life insurance. For the ones that did fail can blame their failure on poor management. It can be truthfully said that no soundly managed life insurance company even approached insolvency during the depression. The failures can be traced without exception to men and methods which were foreign to the accepted high standards of

life Insurance.

In some cases ownership fell to men who were more interested in the business of stock manipulation than they were in the business of insuring lives. The investments of these companies were deflected into speculative undertakings which yielded to the weight of the depression. However-and this is important-even in these cases re-insurance was effected, death claims guaranteed and protection—the primary purpose of life insurance—fully maintained.

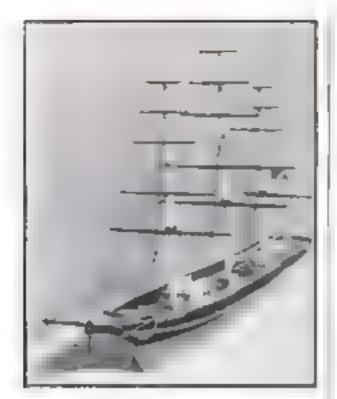
FROM the preceding facts and figures it becomes apparent that there is hardly a reader of this magazine whose welfare and security are not, to some direct or indirect degree, dependent upon the continued success of the life insurance

companies of this country,

Life insurance is an institution which has been built on a scientific and sound foundation. It has come through three major wars, five serious depressions and innumerable epidemics. Today it is larger in size and transacts a greater volume of business than any other industry in the

United States. We hope it has been shown that life insurance has done its job, and done it well, and that by doing it life insurance has earned the continued faith of you and the 85,000,000 other people who are concerned with it. In conclusion it may be said that no one investment offers the rich, poor or average man the same, equal opportunity for entrusting large or small funds with utmost security and dependable returns that legal reserve life insurance does.

Coppropriest reasonal



# Complete Construction Kit ClipperShip Model

EVERYTHING you need to make a beaut to little manature model of the famous American cupper Sea Witch is contained is a construction kit offered by the Popular Science Homecraft Guld. Unitle all previous chipper ship models, this one has been so greatly simplified that unyone can build it Indeed, it is what is called a "pocketknife" model because so much of the work can be done with a penknife and a few single-edged rayor blades

The hall of the mouel is 9 4 in lone, but the over-nil length in 13 in, and it stands if to high. The kit contains the hull carefully sawed to shape by hand from accurate master templater half a dozen places of pine cut to approximate sizes for the deck fittings and boats hardwood for the keel, stem, sternpost, rudder and other parts. three sizes of round stock for the maste and spare. Aber for crosstrees and caps, thin hand-dyed lizen rigging cord of the finest quality, thread, small chain, beach, fine wire, casein glue-in fact everything but the

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That—Almost Overnight—Can

# Sweep You to Riches

This is among the first public amountements of what is undoubtedly the most amening money-making opportunity ever offered to the readers of this or any other-magazine. It takes how any ambitious level headed man can establish-practically overnight a remarkable new kind of business that can pay a steady net cash probt of \$40.00 a day in bus ness that offers unlimited opportunity—a business that is destined to make many man independently mealthy,

HERE, briefly, are the "high-spota" of this thrilling new business that will treate fortunes for those with the vision and inresight to get in on the ground floor

1 An atterly new product with a natural, staple demand and big repeat business, yet one that has all of the appeal of a novelty.

2 Requires no house-to-house canvassing or selling. You simply manufacture. Stores will sell your entire output.

3 Produces \$40.00 a day not profit, selling your entire output at

Pays steadily; no lean seasons.

Big profits to be made in smallest town or largest city.

Absolutely no experience needed to be successful.

No expensive equipment needed. Your whole investment will be less than your first week's potential

This is truth; not Schon-fact; not theory. To the heat of our knowledge, no other business in America offers one-tenth the opportunity for profit and lodepend-

#### Vision Turned to Reality

A few months ago, this amazing moneymaking or each was nothing more than a cream the vision of is shventor Today, the patient is a realist with every detail perfected complete with tested puns of operation worked out sall necessary equipment ready to turn over to hose who are preparet to develop the new gold mine

#### No Seiling-No Consessing

Do not confuse this new product with anything you have ever beard of before It is not a potato chip, but candy, not a cheese chip, not a paste preparation not a popoorn-but a natural product that comes from the sky rom the ground, and wint the air. It is not like anything you ever saw or heard of or imagined. The simple truth about it is stranger than your widdest dream. And you can be the first to scoply this great demand, selling your entire output at wholesale to stores

#### 5100.00 a Week, Net, to Start

According to accurate figures, the very minimum of the first operation should produce a net cash profit of at least \$100.00 a week. Since it is possible to make 840,00 a day you can see that it would take only two and a half days of full operation to make a profit of \$100.00. The we figure to be a minimum. We would not be interested in accusing men who could not make at least that much every week. Then, as demand mercases additional men can be put to work for you and you ran double your weekly profit as steady repeat busness develops

#### Na Expensive Equipment

Ordinarily a proposition as big as this would require the purchase of expensive equipment. But our manufacturing proccas has been so simplified that we can furhish you with everything you need, start off making a profit the very first day—all for an investment of less than \$150.

#### No Experience Needed

Absolutely no experience is required to quickly become successful in this thrilling and fascinating new business. We tell you how to start-how to establish yourself quickly-how to operate the business the very day you are ready to go. We furnish all becomery plans, systems and equipment. Any man with ordinary intelligence and a real desire to succeed is bound to make пипасу

#### Small Town or Big City

Another feature that makes this business unlike any other is that it can be operated anywhere. No matter where you live-inthe smallest town or the largest city-you can establish yourself practically overnight and start enjoying an independent income at once. From the foregoing facts, you can readily see that this is not a business for the timed operator who is satisfied to make a bare fiving, but for the wideawake, aggressive go-getter who wants to see his energy and enthusiasm produce the greatest possible results in the shortest time

#### Facts Sent Pres

To all such men, we request permission to mail an unusual and complete presentation. After you have read the amazing facts and ficures in this presentation, then you can decide whether or not us initial investment of less than \$150.00 is too much to ask for a complete business that can pay lack that investment in the first week of operation, and then concenue to pay as much as 8257 DO a week net profit to those men who have the ability to organize and d rect other men.

#### Act Quickly

There is no time to lose. Today this proposition a new Tomorrow and the pulled to the ald r new week a little older at I So get the facts withour a moments don. It's the new courts in any encourts se of his sort. he around floor operators, who assess tend the richest renards

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# Radio at New Peak

with many Adda New Word NOVEL FEATURES ByR. M. BOLEN Secretary, Popular Science Institute One of the larger units HOW BULL BOIL an all wave fell covering all the bonds A super m dget that a small enough to lit in an overcost pocket It used two tubes

> EVER before in the history of benadeasting have radio manufacturers offered the public so much in the way of novel re-

> Glanting over descriptions of the latest models one finds such conveniences as automore-volume control visual tuning universal A.C.-D.C. circuits ill wave dialing, compact cabinets, automatic-tone control, and silent tuning. Each one a step toward the goal of perfect radio reception.

> In terms of convenience quality selectiveness, and sensitivity, the radio fan s dollar was never worth more. To make up for the descrencies of the human ear. radio regmeers devised an automatic tone control. Operating in conjunction with the volume control, it serves automatically to adjust the high and low frequencies, increasing them with respect to the middle register when the receiver is set for low volume. Counted with improved speakers, used singly and in pairs, automatic

tone control makes improved fidelity pos-12 3 17.

Although automatic volume control is not entirely a new feature, it has come into more general use in the newer sets. With it, aignals can be received at a coneven volume without the annoyance of playing or fading. For any one setting of the volume knob, the amplities are is varied automatically and accurates o being in all stations with equal screensts.

Silent tuning in just what the name amthes. It is tuning minus the ear-splitting souris and sputters. An ingenious automatic-noise chirinator, acting like a gate, cuts out all the unwanted noises. Between stations, you hear nothing

Besides tending toward automatic feauses, however, the present day radio shows another definite trend-compactness and fewer tubes.

A year ago, pagmy receivers having four or five tubes housed in tiny cabinets took the country by storm. Operating on direct as well as alternating current, these jewel-box midgets were found to give surprising performance for a minimum of

Today further developments are being made along this same line. Only recently a large manufacturer of compact receivers announced a new super-midget. A tiny two-tube loudspeaker set that can be tucked easily into your overcoat packet Complete, the entire receiver, which upgrates on direct as well as alternating current, measures (Continued on page 11)

## RADIO AT NEW PEAK WITH NOVEL FEATURES

(Continued from page 10)

only three by four by five inches.

In viewing the 1934 radios in general, one finds that this germ of compactness has spread. Even many of the larger circuits are being boused in smaller cabinets. Almost every manufacturer now features semi-compact six-tube superheterodynes that are the equivalents of earlier eighttube sets. Multi-purpose tubes have made space saving in larger circuits possible.

In his search for a suitable receiver he enchanged has three general classes to choose from-midgets, semi-midgets, and regular full-size outlits. Each group has its advantages and each file a need.

During the past year, the shorter waves have gained in popularity. What was once the domain of the amateur experimenter is now a field of exciting exploration and fun for the regular radio fan.

This short-wave hobby has fostered the growth of a new group of sets-all-wave receivers. Many of the larger circuits are now equipped to bring in European, amateur, and police stations as well as the regular broadcast band. Even the smaller compact and semi-compact models show the short-wave trend by making it possible, by the flick of a switch, to bring the adventurers of the police band into your living room

New and improved battery-operated receivers also are available. Homes not wired for electricity now can enjoy all the comforts of a modern radio. Such fea ures as automatic volume control. full tone dynamic speakers, automate noise reduction, tone control, and up-todate cabinets have been incorporated in the modern battery set

In most cases, a relatively new and revolutionary air-cell battery forms the filament supply. This improved battery requires practically no attention other han a little water once a month. Yet its ife, without recharging is about 1 000 hours or almost a year of radio use

No matter what your 1934 radio desire may be, you can fulfill it. Never before has so wide a choice been available and never before has convenience, lone, and quality been at so high a peak.

In order to make these articles valuable and interesting, Popular Science Institute would like to know more about your particular radio needs. Will you help by answering the following ques-

How many radio sets do you own?

Are they bettery or all-electric?.....

man reasons some one of the contraction What type are they? Broadcast. Short-Wave. All-Wave. Where are they located? Living Room. Bedroom. Camp. Automobile. Kitchen. Game Room, ......

What short-wave programs do you like best? Ameteur. Foreign Stations, Ship. Police Calls arms amon

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# Our Readers Say

# That Round-the-World Idea Surely Sounds Good to the Artist

I success that a certain member of the Popular Science Monthly staff by sent on a trip around the world to study the subject of antional dress. I refer to your cartoonist. His effort, which a companied my last letter, borribed me in its resemblance to a famous Scotch comedian who is responsible for the impression in America that all Scotsmen are garbed as indicated in Our Readers Say But

Readers Say Bat that is a mere traffe I read in a recension of Porciam Select F. Minutes of Minutes. But amount urge to become a Detective Obviously she is the victor of movie had lucing son. Doubt less she has been inspired by the ingentious unrave ling and solving of crime move.



teries, by one of Hollywood's glamacous brandes (alleged) who has come into primit neitee of inte through her appearance as the lady steath. Or perhaps it is just further proof of woman coming into her own the specif of the times, emancipating and sess equality. She wants articles on the work of women in the field of crime. The said the to have in already enough woman interest in the precious pages of this magazine in the household section? I suggest she stick to her numerous movie weeklies.—1. McD Calagow, Scotland.

### Here's a Heat Problem That May Stir Up Your Wits

Will some trader please tell me why it lethat one can put hot coffee in a various outle and it will stay hot for ten or more hours and the only thing that keeps it hot is the vaccum between the two bottles? Yet the theory is that the heat the earth receives from the sun during the day is radiated out into space at night and yet the space outside our earth's atmosphere is as good a vaccum as the one in the vaccum bottle. This doesn't seem reasonable to me -- H. N., Benton Harbor, Mich.

### Just Buzzing Around Landed This Automobile in the Ditch

Hant's one to add to your list of queer

things that happen to people in automolies. A friend of mine was driving along a country roun when a mosquito flew in his ear. Its busing near the ear-drum drove him frantic. In trying to get it out, he randed a ditch Fina a he had to go to a ductor who poured something in his ear-



and drowned the insect !"-E R , New York.

## Embattasung Facts Submitted Regarding Man's Evolution

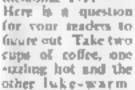
W. H. R. and C. A. S. W. H. R. allences that, "there is no similarity between a human enthryo and the (embryonic) fish" They are, in fact, almost identical up to the last few stages of development. Nor are the gill-clefts to which he refers, "nothing more or less than pharyngial arches." There are six of these gill-clefts, all richly supplied with blood, four of them with most of the blood vessels, later degenerate. The remaining two are salvaged for use as rustachian tubes Upon what basis does W. H. R. state that, the argument for evolution from similarity has been exploded?? If an, how can we ex-plain the identical basic structure of the higher vertebrates, and more fundamentally, of all animals? How is it, then, that the Supper of the whale, the hand wing of a but, the fore limb of the elephant, and the hand of man all are homologous? Their functions are certainly dissimilar Is W. H. R. unaware that be has, rubbitlike, an appendix, a remnant of a third eyelid (which the lower primates find very useful); unused hose, enr. and scalp-twitching muscles; and to F. Lot Appeles, Calif

# Good Enough; Still That's Not Much Out of Sixty-Two Years

I get quite a back out of the sense and numerose of Our Readers Say. For instance M. H. B., of Portersville, Ohio, says, in a recent levie, that he has something to rrow

ON

about because he have the more almost complete back to and including 1925." Now what will be think of the Thave all copies, including covers, back to and including 1921 Here is a question for your teaders to



From a height of four or ave inches, allow a spoonful of spear to flow slowly into first use cup and then the other. As the sugar enters the luke-warm codes no appreciable sound will be beard, but as it enters the hor codes a sort of hissing noise will be heard. How come? Try it out and give me your answers. J. C. B., Pherias, Aria

## Now the Gyroscope Is Asked To Give Perpetual Motion

On yours Our Readers Say page in a recent tieste, is a letter concerning a gyroscope, by W. A. of New York. I wash to add the following thought on the subject of a gyroscope as an independent hody. Gyroscopes, when subject to a torque and moved in one direction, resolve this torque into a turning on an axis at right angles to the applied torque. If then a gyroscope is placed with

its axis kept at torty five degrees to the carth's axis, the turning earth will cause the eyroscope to revolve about an axis perpendicular to that of the carth. All that remains, then, is to secure a gyroscope of small enough friction to turn it, and apply the turning torque as a result of the earth's revolution to the spinning of the gyroscope and the creation of free energy as perpetual motion, the energy being obtained from the earth's rotation.— J. F. D., Norwood, Ohio.

## Sunlight's Moving Shadow Confuses This Reader

Will some of the readers of the good magazine, or the publishers, please explain the cause of the following effect. I have observed for some

observed for some time that suntight, shiming through a window that he directly over a bot radiator, costs wave moving shadows on the wall at the other side of the room in the place where the sunlight strikes the smooth surface of the wall. This effect seems to be mases by the heat from the



tachator ascence on the one in beam of sunbubl. A gust of cold is most the shacon of to stop moving for a shirt one if W. Van Buren, Mo.

# One Reader, at Least, Wants Plans for a Seismograph

In south of the recent issues of Popi Lie Science Monthley, I have read of amateur astronomers building their own seismographs and if they can build them why not print an article on the construction of a simple on such as the one they built? And why not print a series of articles on the construction of high-frequency phenomena apparature induction. Telsa and Oudin colle? Keep up the good work on increasing and chemistry—I.F. W., Presented Massers

#### This Cynical Reader Tends To View With Alacm

With a contrast in two inventions that you describe on a single page of your February base—by some fronty in adjoining ar-

ticles! One is a detice for saving haman lives a hieboar so skilfully contrived that it may safely be notten away from the side of a solone vessel with its precoustar go, even if an ermanned. The other is a device for instroving human aves a mile a to hate war tank, ready



to spout death from a gun brist on in it-

turret. I wonder which inventor is prouder of his accomplishment! And I also wonder if either one has any real significance in our glorious march toward civilization which, as far as I can see, persistently hangs around some remote and obscure torner,—P. B. Y., Scranten, Po.

### Mysterious Knock in Auto Leads to Strange Discovery

I wish to thank you for the many things of interest I find in every liste of Popular Science Montally, and especially for your articles about automobites. The many defects that turn up every day in autos, many of

which are mentioned in your magazine, make one flook an auto is still a mystery. Here is one that I found and it may be a good thing to pass it on to others; I had changed the oil fiver and it had been in use for 20,000 miles at least Arterward I heard a had knock, and went that the strength of the still had been in the formal and knock, and went the strength of the still had been in the still had been in the still had been and the still had been and the still had been and went the still had been and a least a le



looking for it. While testing every thing, I took off the filter pump and to my surprise I found the opening in the tee on top of the pump leading to the filter was entirely closed. I am sore it has always been closed. The port is naturally small anyway and what would prevent it from becoming clogged any time? Don't you think it would be a good idea to look this over when checking up on the oil em? The filter certainly is no good if it is not getting circubition. By the way I havnot found the knuck yet.—M. F. A., Contains

# Bicycle Rider Challenges the Long-Distance Record

I may just come across an issue of Post -TAR SCIENCE MORTHUR IR which I find the statement that Charles A. Stoops, in twent. years has rioden 175,000 mues on a bicycle. aps, has work out three machines. I to is, I can bent this record as I have ridden-100,000 miles in filteen years and all on the same machine. I got my first bicycle on the 20th of May, 1918, and finished my 100,000 under on the thirtieth of last June Since then I have added 3,500 miles to my total In July 1 rade 1,040 miles. In making the entence I have made no long trips with the exception of several excursions to Seattle, & distance of 114 miles. Otherwise all of my riding has been to and from my home to the city. and to other local points. I am now sixts two years old. T. S., New Westzanster, B. C.

# Tear Gas Replaces Lasso in Wilds of Pennsylvania

In with and woodly Pennsylvania, science has done away with the lisso and the comboy's act of hog-tying. When it came time recently to inoculate a dozen at so tame buffalo that room the county parks, the

attendants used tear-gas bombs to saidue the anemals. Just another step forward. I suppose But somehow, I can't picture a range cowboy stnerne The Last Roundap, and reaching for a can of tear gas instead of his lasso. And besides, what all become of our wild west shows and ro-



dees if science modernizes the western ranch? -- L. D. V., Pittsburgh, Pa.

# Boom in House Trailers Is Confidently Predicted

AM very much interested in house trailers. Lately, however, I have seen very little in your magazine about these useful conveyances. They are being homemade by the thousands and as conditions become more bearly normal they will be built in ever increating numbers. I am sure of this because three years ago, when I first started out in mone, it was a novelty. But during the last summer there was a marked accrease over the number seen in 1932. I know of eight rain is that have been built from mine and it is bard to say how many were built from those eight. I now have under construction a reach-type trader with a top and rounded corners. Now I would like to ask why you do not run a series of articles telling, from the ground up, exactly how to design and huild traiters? Also there should be a set of blueprints for each unit and chassis so the unmusted would have no trouble with the work - W P M. Mansfield, Ohio

# Lost in His Attic. He Finds a Forty-Year Old Treasure

Intachs my pleasure and surprise when during a search through the attac I discovered three issues of Portuan Scitter Moximix of the years 1891 and 1892. The issues, which are well preserved, are for february and June, 1891, and September, 1892, and carry articles that stand up well after more than forty years of scientific progress. The magazine, as published as that time, sold for fifty cents. While the magazine was not as producely (Bustrated to it the modern version, it was gutten up tune has a permapeut book. Each house satured "New Chapters in the Wartare of Science." by Andrew D. White, LL D.

I. If D , and the soporting articles to a er a wide range of interest, all the may from tobacco and the tobacco habit to the decime of bibliolatry and the ficaware Indian as an artist. There is a section devoted to reader correspondence in some of them, and a department entitled.



The Editor's Table. The ads are an edicasend of style and thought. An especial feature is the musican, up-to-the-investe typewriters, and the latest model bicycles af ford much interest, being mentioned in one place as seiling for \$165. In the Popular Muscellany section I find the following From the opening of the New York Parfeur Institute, February 18, 1890, tell October 15, 610 persons who had been bitten by dogs or rats presented themselves to be treated. For 480 of these patients it was demonstrated that the anomals were not mad, consequently they were sent back after having their wounds treated. The patients came from all over the contanent, must dates being represented by one or two cases. When we compare that with the numher who receive treatment monthly today we can get an idea of the advances made in sewnce J F., San Antonio, Texas.

### Acetylene Light Guards His Garden from Pests

In a recent issue of Poet Lin Science, Montrally I read that electric light is being used to combat destructive insects such as the coden with. I have used a somewhat similar method since the early nineties of last century. With an accelving lamp, under which a large dish containing fresh

or better stapy water, I have kept cabbages free from the ravages of the cabbage fly, while half a mile away, three large gardens were trable to produce clear cabbages. Sixty cabbages near the light were free from blemish, while some distance away I was not getting twenty per cent of marketable produce. When the light was not used, the plants were in trouble inside of twenty days. I was using a lantern with kerosene. The radius of its light is not as effective as that of acetylene gas, but it is, in my opinion, sufficient to protect a quarter of an acre. The insect pests are poentiful but the light will effectually keep them in check.—L. G., Sydney, Austraha.

# Solving These May Give You a Nice, Comfortable Think

Can any smart reader give me any inside unformation on the following six memora questions? Einstein's theory in simple language would explain some of them. Was

space ever born? Is there life on any other planet than How was ours? the first matter in he universe creat ed? Is space end kan) If an how did il get to infinity? If the earth were going to be destroy. ed by a cornet and we on the earth were able to dudge it by going outward.



from the earth in a rocket plane, of course what class of people would we take with m and what people would we leave behind? Why are we? Don't take me too seriously on this.—R. D., Jr., Chengo, D.

## Rocket Plane Might Let Short Ultra-Violet Rays Through

IN Provided Science Monthly for January, 1934, I read among other thears, the extremely interesting article on "Lonely Out posts of Science Study Cyclones in the Sun' In the course of that article Dr. Charles U. Abbot is quoted as saying, "This layer of prope, which is less than half as thick as an or linery lead pencil, is all that stands bet yeen life and death on our planet " Now the question I should like to ask your readris is thus. It some one gets a good work able idea for a rucket plane that can be flows through and beyond this ozone laver would the altra molet may come through at the ruptured point and so reach the earth? If they did so, what effect would they have on human life and how could they be controbed?--A. H. W., Wakefield, Mass.

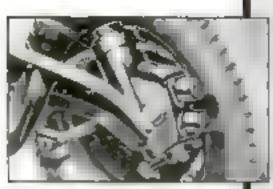
# Why Not Drop the Weight and See for Yourself?

Here is a question I have been trying to answer for months without results, so I have decided to submit it to your readers with the hope that some one, with more mathematical taient than I have wight contri-

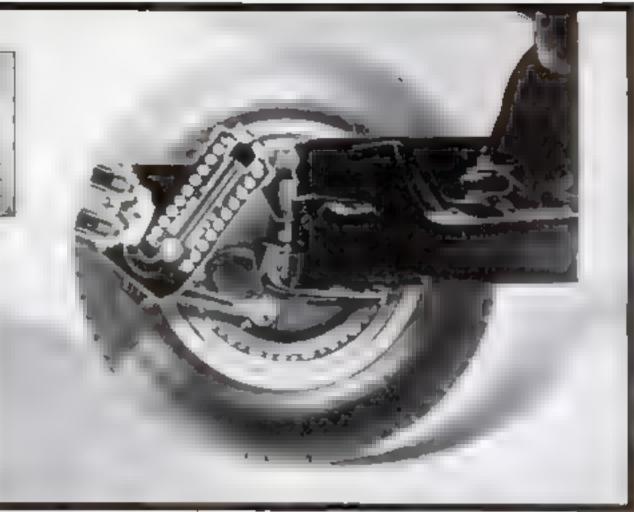
to my recue The question is If a weight of one power is dropped on a platform scale from a height of one foot, what will the scale register? If the same weight is dropped from a height of two feet what will the scale register? That is what weight in pounds, not foot



pounds, not foot pounds, will be represented by the impact in each case?—F M B., Honolule, T H



At the world stand and a satism of one of the harm to have a satism of one of Posters. It is not so that the satism of one of the harm the nation of the satism of the sat



# I-Iow

# Knee-Action Front Wheels Provide More Rear Seat Comfort in the NEW PONTIAC STRAIGHT EIGHT



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When the front wheel of a new Pontuce meet) a hump, the wheel mounts it independently—warrely disturbing the level of the car. The car holds the road with proder efficiency, and precing to maily superved.



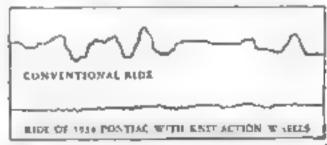
Here is one of the amazing things about Pontiac's new Knee-Action wheels. They classify as a front-end improvement, but their greatest advantage lies in the gentle, rhythmic ride they provide for rear seat passengers.

In old-fashioned cars the front springs always had to be stiffer than those at the rear in order to hold the axle in place and withstand braking forces. In the new Pontiac, however, the front springs have no structural functions. Consequently, the coiled springs in the Knee-Action front wheels have been made practically as soft as the leaf springs at the rear.

In conventional cars stiff front springs and soft rear springs fight each other in their rate of flexing. The car is bound to pitch and gallop. In the new Pontiac, on the other hand, the soft front springs are tuned to react in unison with the soft springs at the rear There is no pitching and bobbing.

The rear seat does not "rear up" at intervals and throw passengers forward. Instead, the car glides along smoothly, and rear seat passengers enjoy fully as much comfort as those in the front.

Write Pontisc Motor Company, Pontisc, Michigan, for full information on Knee-Action wheels.



The two graphs above were made by a highly sensitive instrument detrioped at the General Majors Proving Ground. The top graph request the effect of an extremely rough road on the back of a person in the rear reat of a 1933 car. Fuch peak and valley represents the severety of a foll. The laser graph is the record made at the tome speed, over the same road with the personger on the rear reat of a 1943. Posters. Note the difference in the userity of the disches. On the average legiously the Posters graph line because practically straight.

GET A STRAIGHT EIGHT FOR YOUR MONEY!



# POPULAR SCIENCE

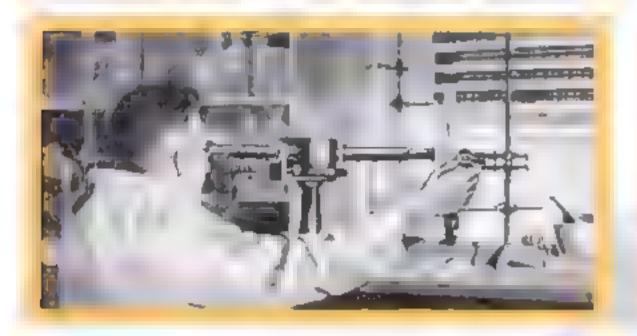
MONTHLY

March 1934

Vol. 124, No. 3

RAYMOND J. BROWN, Edilor





# By Sterling Gleason

Left Dr Kennetd in his aboratory using a specifologie in an analysis of minerate By this method their them is contains are disclosed quickly and use ringly Bolow samples of one to be ground to powder or pain

CHEMISTS DISCOVER

# Fortunes in Common Minerals

ID you ever drink ten mined from the ground?
Or paper your house with fade-proof wallpaper?
Or use paint made from rocks?
These amuzing uses for common minerals are today

making fortunes for prospectors. Big gold strikes like those of '49 are care; but everyday ordinary minerals, meeting the demands of industry, are yielding wealth that dwarfs the

biggest gold rushes of history

A bright blue copper ore accumulated for years on the dump of a large mine in the West. Assayers pronounced it too low-grade to smelt. A chemical engineer, attracted by its bit liant hue, packed up samples. Later he bought the whole pile and shipped it to Germany, where he sold it for \$300 a ton. Chemists ground it to powder and used its natural color as a non-fading pigment to make paints. In California, a new plant is now grinding refuse over in ball mills, for the same parpose. First process provence he ranks and coloring mater. Other brightly colored over are being used to that wall-paper that will not fade.

Many prospectors in search of gold turned their pack mules aside to go around a miniature "Heli's Kitchen" in central California, where jets of steam and fumes of sulphur issued from fissures in volcanic rock. Recently this seemingly worthless piece of land came into the hands of a man with imagination. He brought geologists to look the place over. In the steaming crevices, they suspended copper plates. Returning later, they found the copper covered with shiny

metal ic heads of mercury

Now steam shovels are stripping away surface rock and laying bare the hidden source of the metal, so the deposit



ONCE THIS WAS JUST WASTE

From this formerly worthless by-product of mining, a formule is now being recovered. Ground to powder, it is used as a pigment is ann-tad ng paper

can be mined commercially to meet the needs of a greedy market. Another westerner discovered that a petubar rock on his fairn made good tea. He is marketing the mineral as a beverage

In the blob Sierras a prospe for over a a cabin near an outcropping of yellow-brown mineral. "Have you prospected

this outerop?" he was asked by a friend.

Yes, and it's no good," replied the miner. "Runs only thirty cents to the ton in gold. Not worth bothering about."

La er others investigated the claim and had assays made. They found that the mineral was carnotite, a radium-hearing ore. The carm is still being worked.

Year one mine where gems were being produced, a soft mineral by-product was thrown on the dump. During the war, when metais of all kind were in great demand, chemists found that it contained caesium-a metal that is measure to ight. It was baddy needed for making photo-electric ceas, and brought \$100 a pound. Chemists hastened to recover the fortune that had been thrown away, but they were too late. Weathering and washing by rains had done its work, and the v., jable caemum was gone forever

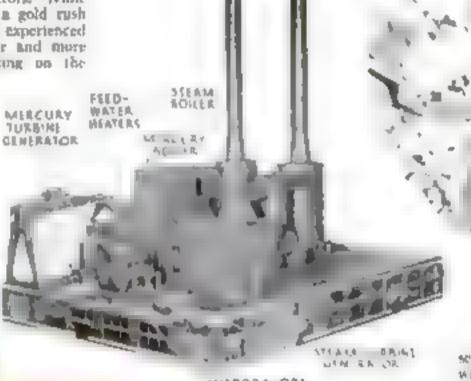
Minerals, all the way from common Epsont salts to radium, are today the object of search by prospectors. While amateur mineri are slaging a gold rush of a magnitude sexiom seen, experienced miners are looking for other and more valuable metals. Back-tracking on the

trails of the aid-time prosactor, they are finding fortunes where he found nothing. Their methods range from simple tests performed with wash pans and portable luts of chemicals, to intricate spectroscopic analyses that require a well-equipped labaratory and instruments her ones are or ng made not shrough lacks discus-

eries of huge maggets, but by the application of scientific principles, plus creative imagination.

In the laboratories, physicists and chemists are evolving methods of starting importance to the prospector. They are opening up possibilities of labulous fortunes from race metals not previously sought by miners. Gold is ridiculously cheap beside many of these mystery metals that are sulunavailable in quantities large enough to meet the needs of

Newest in this field of sea en the mineral linding is the geochemical prospector His instrument is the spectrograph



Lanely prospertors still each gold. and this one-man mine is now being worked in an affort to recover the precious motel from he querte

EVAPORALORS

Model of mercury vapor turbine plant which would not use each of the court to supply of mercury and thus place this metal in wide demand and increase prices

the device with which elements were found in the sun before they were known on earth, and which led chemists to look for the rare metals and gases that have now filled in the last gaps in the table of elements

In a laberatory of Persona Cellege, in California, Dr. Theodore G. Kennard is working on new methods for such prospecting. Spectrographic assaying is simple compared with laborious chemical analysis. Oves too complex and difficult to handle compounds that would take themists months to analyze and would require hundreds of pounds of samples, may be detected within a few minutes. A pinch of the substance the size of a punhead is all that as needed. From this the spectrograph makes a mapshot of its structure revealing definitely what metals are present.

Dr. Kennard suggests that prospectors go into the held gather samples of minerals thought to contain care me a.s. and bring or

send them to the laboratory. He we then puck a bit of the substance into a little crater in one pole of an electric acc, or make up a solution containing the mineral and allow some of it to dry over the electrode forming a film.

Under the intense heat of the arc, the mineral is vaporized, giving coing to the flame. This light, passing through prisms is split up in a a series o wer teal bars, shading gradually through all the colors of the spectrum. Gaseous vapors of the metals present, however absorb certain colors. Gaps in portions of the spectrum, and bright lines in others, surpish deposte proof of the presence or absence of each element. Photographic records are taken. Minutely accurate measurements then determine the wave length of the missing colors, furnishing exact data as to the make-up of the sample

Rapidly analyzing the series of samples sent him, Dr. Kennard reports back to the prospector who can then trace the richest samples to their sources, just as a miner follows "flua " or surface outcroppings, to the parent lode

Using this chemical eye, Dr. Kennard can test as many as ten samples within two or three hours, determining the presence of any of forty different elements. Ordinary chemical analysis would require a week or more. For example, to test an ore con a ning one lenth of one percent of scandium, would take a chemist six



In this plant a rock, kicked around for years as of no value is now crushed and from at a good scouring powder is made

# New Treasure Hunters MYSTERIOUS instruments now reveal wealth hidden in worthless by-products that were once wasted. In this way Science has opened a wide new field to clever treasure hunters

months. He would have to have a bag of ere weighing 100 pounds. With the aid of the spectrograph, Dr. Kennard needs unity a half-hour's time and a twenty mi ligram sample not much larger than a

Quantitative analysis with the spectrograph is the newest phase of geochemical prospecting. Measuring out definite quantitles of various minerals, Dr Kennard makes up a set of standards and measares the brightness of the lines they produce on the photographic plate. By comparing the spectrum of an unknown sample with the standards, he can estimate the occurrence of any element within a thousandth of one percent

Penetrating still further into the mystenes of the molecuse, Dr. Kennard uses ultra-violet light to detect the presence of some minerals. Certain compounds that look white under ordinary light, are coursed under the black light. By accurately charting the colors, Dr. Kennard can area vize for these substances

The rare metals, however are not the only minerals that offer fortunes to the trained prespector Like gold, they are aund in such small quant ties that their

capital than the average miner can supply. Gold itself, although one of the most widely distributed of elements, is rarely profitable for the small hard-rock miner, according a prosper ors of the new school

We were developing a r aim an which gold was located in a stronger of quarte one small scale miner told inc. "The use steelf was rich, assaying nfty dollars to the ton, but to get it, we had to remove a stratum of very hard granite. After we had spent several months of hard work and had a quantity of

ore ready to go to the smelter, we look out a piece of paper and a pencil and did some figuring

"To get a ton of ore, we had to remove a volume of rock three feet wide, five feet high, and thirty-five feet long-about thirty tons in weight. Actually we were being paid about \$1.50 per ton for the hardest of back-breaking pick and shovel work. We could have made more digence a ditch an the faty

Unlike gold, many minerals are found

in buge quantities in an almost pure state. Although they may be worth much less per ounce, their volume makes a strike more valuable than a gold mine. For example, the sodium-impregnated waters of a lake in Texas are soon to yie d large quantities of sodeum sulphate, a chemical that is used industrially in large

amounts. Chem-

ists to whom the problem was but becovered that

the chemical can

be extracted in a

practically pure

Another mineral occurring in large deposits is diatomaceous earth—a substance consisting of the abells of billions of microscopic water creatures, or diatoms (P.S.M., Aug. '33, p. 34). Their death builds up deposits of a mineral earth, beretofare used chiefly for fine filters in oil retining and other industries. Naw another demand has been created. Ground exceedingly fine, this substance makes a face powder that is said to be superior to rice or starch powder

ter. The source is thought mexhaustible

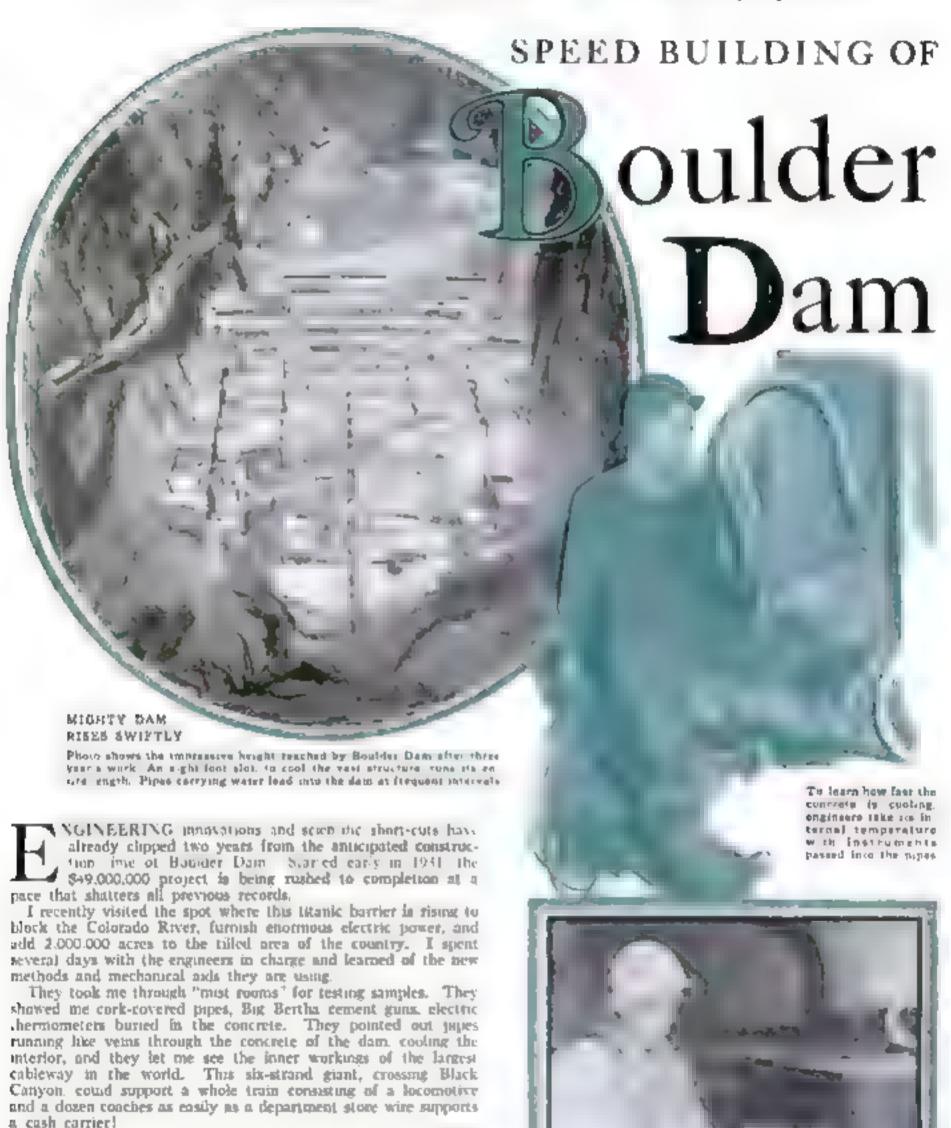
Pumice, a light, cindery rock ejected in large volume from volcanoes, might seem worthless; yet it is now being ground up and aprayed from airplanes to prevent milder of the huge cantaloupe fields of Imperial Valley, California. Its countless tiny pores absorb the fumigating gases used, bringing here into compact with the plants. Added to concrete, it is also lending seawater-resisting qualities to a grant new breakwater on the Pacific coast.

A hard rock found in Keen County, California, was passed up for years as valueless, until a man came along who recognised its value to the automobile industry. He bought a whole ranch to get deposits of this rock. Now it is being mined to make spark plags.

Scientists are setting out to create markets by finding new uses for minerals that are in plentiful supply. For example milions of tons of oil shale tan a use oil men and chemists. They are too lowgrade to be important sources of petroicum at present prices, yet they hold tremendous potential wealth.



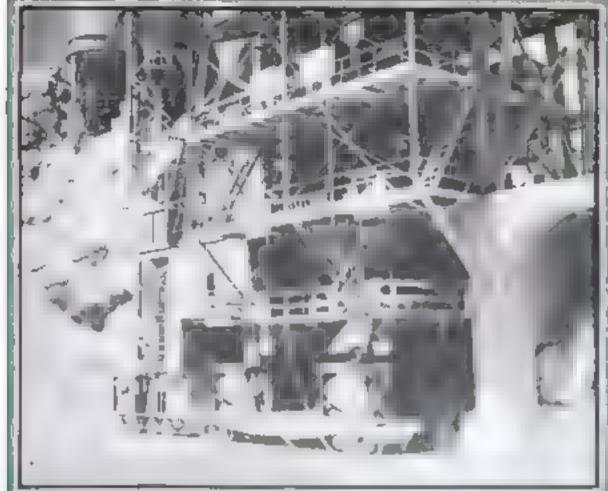
# Mechanical Marvels



Night and day, every day in the year 2,750 men work in shire

using the latest equipment in their race to complete this biggest dam in history. When it is finished, it will rise 730 feet above its foundation, higher than a sixty-story building and 325 feet tailer than the Owybee dam of Oregon, previous holder of the world's record for height of a dam

With the apparatus seen at right the temperature of the dam is taken do sy 5 milar records will be made during the structure a entire Life.



Below a cone of fresh concrete in below tested to see if it will settle at a uniform rate. This test is made frequently



In this plant, at the top of Black Canyon, concrete for the great dam is m tod. Photo shows care being loaded. From here they run along a tax way but t up the canyon wall and are sumped where needed

because concrete is an insulator, sealing heat in and keeping cold out, elaborate precautions have been taken to cool off the interior of the dam. When the crystals of the various axides, salicates, and carbonates interlock as the concrete sets, the chemical action bunds up heat. With out the special cooling equipment built into Bounder dam, it is estimated 125 years would elapse before the interior of its 3,400,000 cubic yards of concrete would be cool. Moreover, the uneven cooling would leave the face of the dam interlaced with cracks and source.

To overcome these difficulties the engineers are burying a vast system of pipes in the concrete. Four large cork-covered water mains lead to the wall of concrete for every ten feet of height. They connect with a network of smaller steel tubes which carry refrigerated water through the interior, cooling it as much as forty degrees. The pipes used in this work will reach a total of 662 miles. They would stretch from Bastimore, Md., to Commati, O., with sixty-nine miles of pipe left over. When the pouring is completed they will be filled with fine concrete and left embedded in the structure

Each tube cools the concrete around it for a radius of thirty inches and the pipes extend from one side of the dam to the

other every five feet. There is no chance in the operation of this cooling system. Several times every day, the engineers stop the flow of water through the different tubes and take the temperatures inside.

Cooling, enable to done with safety. However, a multiple temperatures inside.

E)sewhere throughout the dam 400 electric thermometers are buried permanently in the concrete. They consist of steel wire cols whose resistance to electric current indicates the heat of the interior. The readings are taken at a central station where an apparatus resembling a telephone switchboard indicates the temperatures at the 400 points. Later on, such readings will allow caretakers of the dam to observe changes in temperature within the great wall during the period of its life.

Another feature of the construction which aids in cooling of

By Andrew R. Boone



TESTING CONCRETE FOR DAN Cylinders of concrete, cast from the reguler product are clushed in this machine on a test of the material being made

Concrete to driven through this pipe of the point of obstation. The we know to manage using the said pressure that forces the concrete forward

the mass of heated concrete in an eightloot slot extending down the center from top to bottom with received aidea resembling the teeth of a giant saw. By a lowing the concrete on either side to cool as it is poured, it relieves atrains and its design is such that when water pressure increases on the upstream aide, its teeth will took so tightly it will be one of the strongest points in the wal.

By erecting the dam in two sections, each composed of numerous blocks used together for strength, the engineers have also speeded up the cooling time of the structure. More than any other single and, these steps, taken to insure quick

and, these steps, taken to insure quick cooling, enable the builders to rush the construction of the date with safety

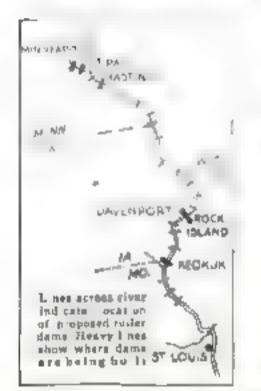
However, a multitude of other activities which go an behind the scenes hasten the work of construction and avoid costly mistakes such as the pouring of concrete with insufficient strength.

Every hour, for example, experts make "slump" tests. From the mixers, they take buckets of fresh concrete, remove the larger tooks and place a batch in a metal cone. Suddenly, the operator bits the cone from around the sample and then measures the slump, or distance it setties. This simple procedure reveals instantly whether the material going into the dam has adequate body

Again, government engineers in the (Contracted on page 100)

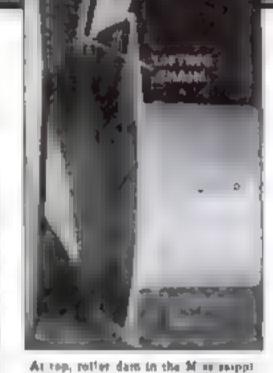


Dam That Rolls Up to Control Mississippi



which we repend on tests of the Davenport

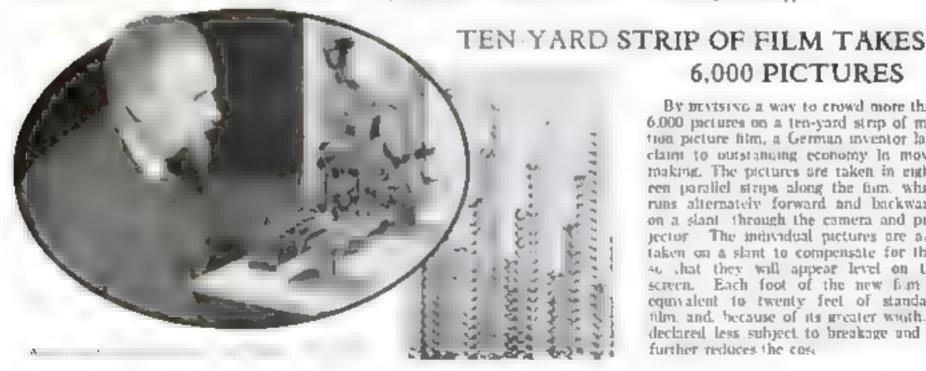
structure. Eleven 100-foot cylinders of steel, earth one twenty-six feet in diameter, now regulate the flow of the river at Davenport. When submerged and billed with water the hollow extinders onsiguet the river and raise the level behind the dam. Each one can be empired of water and drawn clear of the stream in six minutes. Drawn by lifting champ. it toles up a track provided by inclined, toothed racks on each abusing pier, which engage gears at the ends of the cylinder itself. Electric motors of



At top, rotter dam in the M se seeppt Abave, close-up of the lifting much union that moves the cooling dam

only twee vive horsepower handle the rollers. Current for the motors is obtained by a generating plant tha uses he head of water at the dam, thus compenling the river itself to furnish the energy that moves the strange dam and controls the mighty Mississippin

6,000 PICTURES



By priviling a way to crowd more than 6,000 pictures on a ten-yard strip of motion picture film, a German inventor lava claim to outstanding economy in movie making. The pictures are taken in eighteen parallel strips along the firm, which runs afternately forward and backward on a slant through the camera and projector. The individual pictures are also taken on a slant to compensate for this. so that they will appear level on the screen. Each foot of the new fam is equivalent to twenty feet of standard film, and, because of its greater winth, is declared less subject to breakage and so further reduces the cosc



At left, passenger transport plane making a land up in a ama' field with the aid of its air brakes. Below diagram shows how air brakes do rease required and up space by curting the speed at which a big plane can come down to the earth

MITH MANARALES PER HOUR

# AIR BRAKES ON PASSENGER PLANES CUT LANDING SPACE

Are brakes, already tried out successfully on a few private aircraft enter the field of passenger transport for the first time with their installation in a fleet of new transcontinental air liners. The brakes consult of special flaps, mounted on the trail-

ing edge of an airplane wing. They are depressed in landing and reduce the machine's speed so much as to decrease the required landing space by two-thirds. Thus they end a documn of aviation engineers, whose problem was to design faster airplanes without increasing their landing speed or extending the space required for a safe landing. As shown in the accompanying diagram, a plane equipped with the brakes can runt up to an airport at estating speed and then abruptly six down

500 FEET

# SPIN OIL AT HIGH SPEED TO TEST IT

1000 FEET

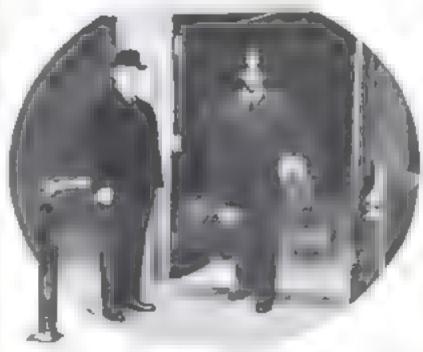


This machine spins out as high speed to test its efficiency as a jubicenst

OUTSTANDING 180b. lems of lubrica ion may or selved by a new man chine zerst in its kind that tests and grades oil lify whithing it on metal banda at speed up to 22 000 revolutions a minute. By weighing the bonds before and after the test, as shown at left engineers can eage the ability of the oil to penetrate and cling to metal. The first research task of the machine will he to solve lubrication problems involved in the operation of railway transportation

### ELECTRIC EYE OPENS RAILWAY STATION DOORS

FOLLOWING successful tests of a single installation, six main doorways of the Pennsylvania rattroad terminal in New York City are to be equipped with magic doors that open without the touch of a human hand when anyone apprinches them Operated by a light sensitive electric eye, the new type of door has proved a boon, during In initial trial, to elderly persons and porters laden with bundles. This is bedeved to be the first apilication in a milway station of doors opened by the operation of photo-electric cells, although similar installations have been made eisewhere.



Railway station door opens itself at pedestrian's approach



## SOUNDPROOF CAR MAKES NOISY SUBWAY QUIET

Strucky redert in New York City recently enjoyed the novelty of silent travel
when a soundproof car of new design received its first service tests Instruce
shuts out the roar while five air-couch ioning ducts in the ceiling take he place eopen wedows to iting fresh air to cassingers. Even the lark I banging the new
tween the cars is suppressed by encasing
them in tubber tubing. To demonstrate the
efficiency of the car the wir lows were
opened during the trials and the iamidiar
deafening noise was heard.



## BIGGEST STONE MIRROR USED BY ANCIENT RACE

Long before advered gians was beard of natives of Central America admired their reflections in mirrors made of stone. One of the largest ever found, constituting a tate archaeological scovery now reses in the Lr venety of Fransysvania Museum I disher it gmee's a hema no a lustrous res mesers, were joined in its abusebt craftsman in a disk-shaped mosaic asshown shove to provide a hand mirror

NEW VEHICLE IS HALF AUTO AND HALF PLANE Half auto and half prace, the fract wheel of this new web c'e leaves the Etound se mach se hern begh spred

HALF automotive and half aimlane in appearance a hybric vehicle cailed the rossiparite has been invented by Prof. T Farward Moodie, aeronautical expert at the Georgia School of Technology who is les ng aus his och creat in in service tests When the car attains a fair rate of speed

the driver operates an elevator control that lifts the small from wheel from the ground. The car then runs on the two main wheels while air rudders steer it. like an nirplane taxing across a landing field. As the car comes to a stop, the front wheel settles to the ground. Controls resembling those now used on an airpiane are supplied to guide the unusual vehicle



# VERTICAL HEADLIGHT ON STREAMLINED TRAIN

WHEN the 110 mile-on hour streamlined train, now hearing completion in a Chicago factory, is placed in service by the Union Pacific Raisroad, its locomotive will be the first to carry a vertical headlight Engineers decided to install the perpendicular projector, as well as one of the conventional horizontal type, as a safety feature, since the aky-pointing beam is expected to attract the attention of motorists and pedestrians as the train rushes toward a grade crossing. In addition, the new head ight is expected to prove a helpful beacon to aviators skimming along the route of the all aluminum train.

ACCURATELY built to scale by its mocieco-vear-old maker a Navy amphibian plane model just completed by Ben Hammer it Pasadena. Califa is declared by experts to be one of the mast ne ils perfect at its aind. The mini ture teach ne is pa terned effer the Lorning type in govtriment use and a powerer w ha bree quarter borse nower morne & httmgs, her complete even to retrainly kinding gear and machine guns The illustration at left shows the amphibian model in the hands of its young builder who is building airplane models for movie studios



Para hute jumper wearing his lamp hat is powered by wind

Track In high v a sole and ug in nigh racets British parachus jum ger success fully uses an eleric rampi scramped to his work or which current is provided by a wind-driven generator on his helmet

A diminutive two-

bladed propeller which the generator during his long drop. The use of this apparatus avoids the necessity of carrying heavy batteries that would prove an encum prance and an undestrable added weigh-



Vertical beadlight on an all-aluminum 1,5-mile an hour 11210 warms morning of its approach

# BIBLE, 1600 YEARS OLD, EXHIBITED IN MUSEUM

GUARDED by armed detectives, the world's most valuable manuscript, shown above, has fust been placed on public view at the British Museum in London, England. The book is the Codex Smarticus. one of the two oxlest Bibles is existence, which was penned in the fourth century and discovered centuries later in a monastory on Mt. Sinal, in Egypt, Later owned 15 Russia it was recently purchased by Great Britain for \$100,000, about half a million dollars. Its Greek text and velium e and still in excellent cond a a ak takes the last part of its the its place of discovery, when ntra to to to shed from the state

## NEW MACHINE COUNTS IONS IN ATMOSPHERE

It advantages how durying the ebochette as in the air has an harran beings. P.S. M. Feb., 34 p. 111, a new tool haven developed by Carnego Institution as perts. The inscription of known

t that fix y and the fix y and

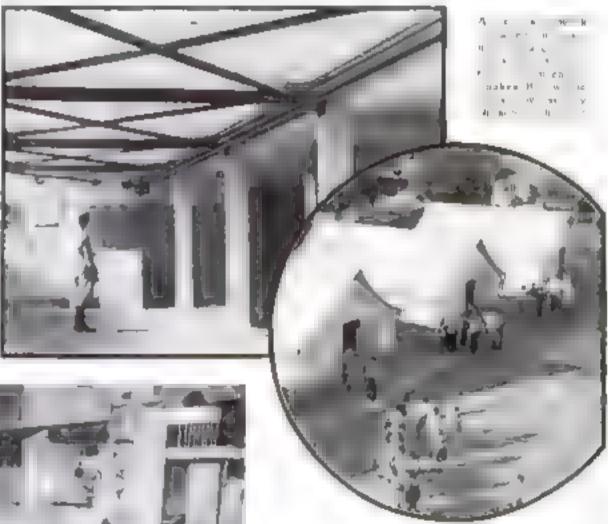
# HANDMADE CANDLES WORK OF ONE MAN

CALLED the last of the candle makers, Jose Herrera, of Los Angeles, preserves the old art of fashioning wax candles by hand. A rotating fron hoopin his workshop supports the hanging wicks, down which he pours molten war from a band ladle. Each candle is revolved by band meanwhile. Ibus spreading the wax evenly Sometimes the candies are decorated with intricate designs of colored beeswax, and perfumed with floral odors. The largest condies Herrera makes are suspended from the roof a bis tiny shop. The biggest be makes would burn for ten years.



Over with suspended from the iran hoop melted was to pouled in making candles by hand. This is the last shop to make unides this way.

# QUAKE-PROOF SCHOOLS FOR CALIFORNIA





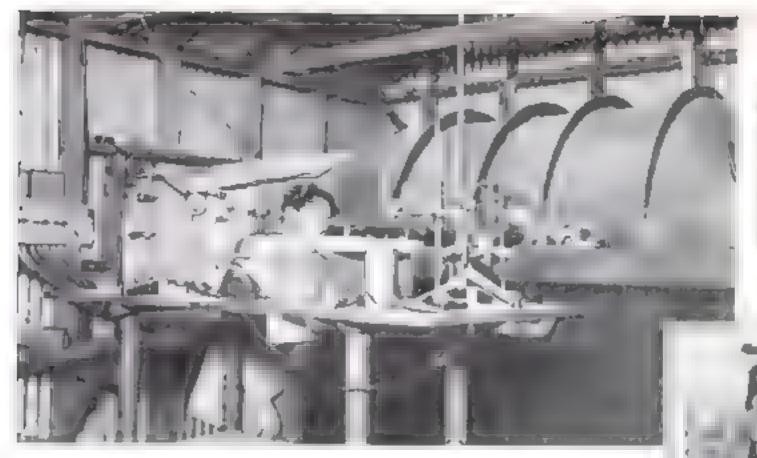
New machine used to count electrified particles in a given volume at air

Mare the solutions we had been less than the remode a of the forms school independently quake-proof in our led. This precaution is taken a larger during another earth as a set Warch Steelwork is being laced in the brick structures to prevent from caving in, and walls are being the act a total estimated a larger mater as the sight of the set of the structure of

quake had occurred during school hours.

# Dummy Torpedoes Shot in Practice





that tested the speed of the A beam of high was finished up and down the tube by means of what on increase. In the two to an end of the tube of tu

# Mysterious Variation in Speed of Light

DES the speed of light, long bedeved one of the few constant things in the universe, vary after all? Experimentars who have just completed the three-year task of liming a light nam in a mic-long vacuum take at l'avadena Cal i are wondering if this can be true. Thousands of the most careful measurements, taken with every scientific precaution, do not agree

Eight years ago the late Prof. A. A. Michelson, renowned physicist, flashed light between intrust on mountain peaks twenty-two miles apart and clocked it at 180 284 miles a second. To obtain a more nearly accurate figure, he directed the construction of a tube three feet in diameter and a mile long at Pasadena, so that the speed of light could be measured in a vacuum. After his death.

Dr Francis G. Pease of the Carnegie Institution, and Fred Pearson, of the University of Chicago, carried on the task of making the observations.

A year ago, as first reported in this magazine (P.S.M., Dec., '32, p. 36), the measurements showed such morked discrepancy with previous results as to occasion a distress call to the U. S. Coast and Geodetic Survey, whose surveyors repeatedly remeasured the length of the tube and found no error there, More recen speecold light observations only emphasized the apparent erratic behavior of the light beam that the acientists were aftempting to clock. On some days il seemed to travel faster than others by as much as twelve miles a second. its speed seemed to vary with the season and also in a mysterious shorter cycle using about two weeks. Finally the actentists ended by taking an average of all the readings, which has just been announced as 186,275 miles a second.

That the speed of light varies, as the tests suggest, is not the only proposed explanation. Another is that recurrent tides in the earth, not hithertu known to occur, periodically shifted the position of the recording instruments.





#### APPARATUS USED IN LIGHT SPEED TESTS

Left above the mile long vacuum tube that was used in measuring the speed of tight. Upper right, using a surveyor's instrument to install, accurately the tube a receiving end

# Breath-Taking Stunts Test

Delicate Instruments Help Pilots Find Factor of



thousand feet above the Pacine off the southern California coast. I was flying the large transport, making ready for the crucial

tent. The two engineers and I wore parachures, for I was about to stick the heavily loaded plane down in a terrific dive, to pull nearly tune tons of airplane and lead born up to the point where the ship theoretically would begin to pull apart.

No airpiane in commercial service ever approaches such a severe stress, but during 150 test flights I made recently in preparing the first of a new senes of air liners for public use, we turned it into a flying laboratory and subjected it to thique tests unknown a year ago.

I have flown military airplanes earthward at 400 miles an hour as I observed quivering instruments recording the stresses and strains. Except for military purposes, airplanes do not perform these terrific maneuvers. Yet for the safety of passengers who later will fly in these liners of the air, we put the big planes through tests that cannot be applied in wind tunnels and which the ships never again will be called upon to face

As I shoved the wheel forward and stuck the transport down in the dive an engineer sat ready with an ordinary pair of weighing scales to measure the force I would apply to the wheel at the instant we began to pull out of the dive.

Down we went as I shoved mightily on the wheel. Quickly the needle on the airspeed meter climbed up to 250 miles an bour, lieyand that speed we could not go for I do not possess enough strength to hold the controls against the termin pressure of the rushing in

I shoved with a fire of 150 pounds against the wheel to hold the plane in the dive. When we had dropped 2,000 feet I re-

verted the process and pulled. At the same moment my assistant in the cockpit slipped a spring over the steering pust and in a few aeconds recorded my pull— 150 pounds.

Thus I applied almost instantly a change of force approximating 300 pounds to pull the transport out of the dive, and we knew precisely how hard pilots on the airlines must bug at their wheels to recover from a dive at high speeds.

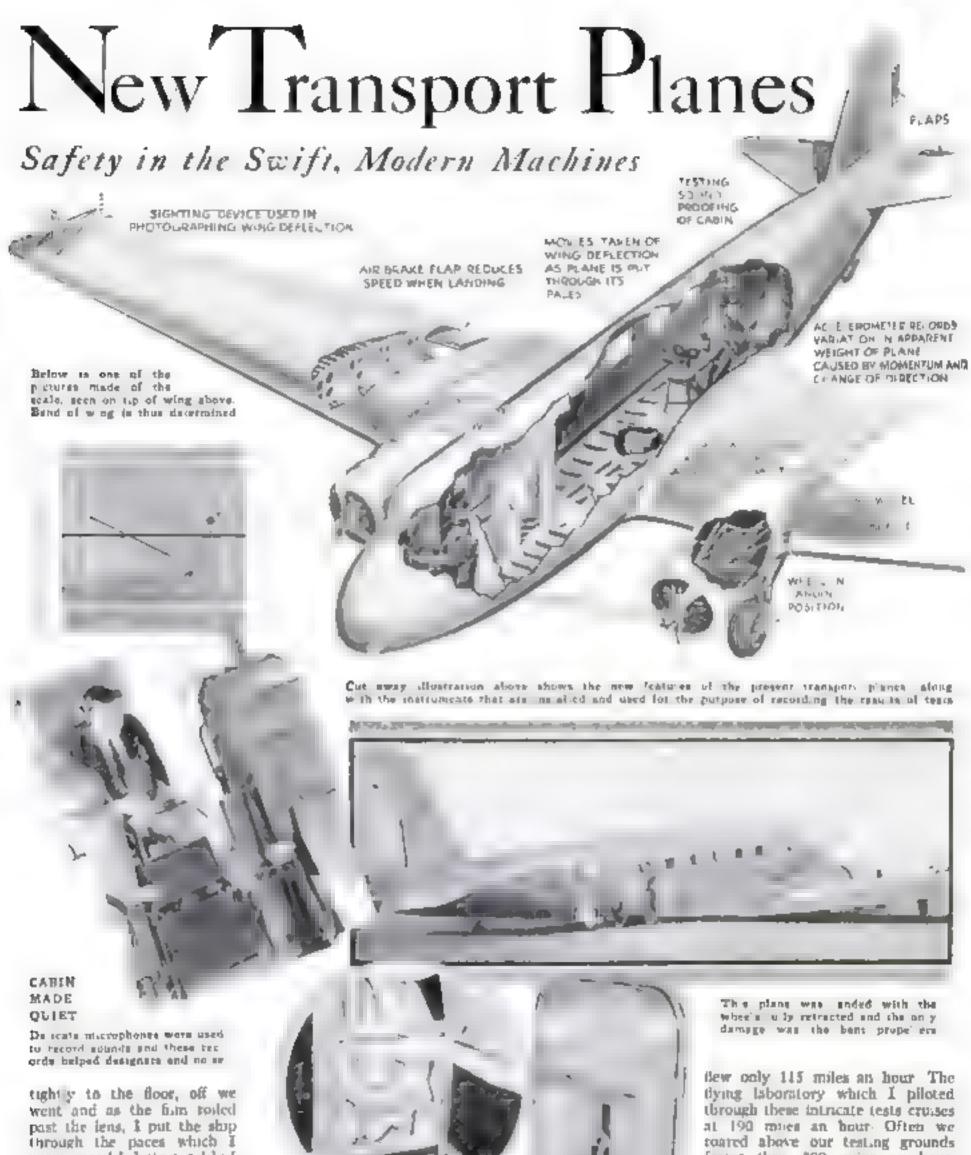
Nor did we stop with measuring forces on the controls. Hidden beneath the floor boards of the passengers' cabin at the center of gravity, was a small instrument containing a floating spring whose pen makes scraggly marks on smoked glass during the pull out. The extra load deflects the spring in this recording acceleranceter.

As I pulled the ship up from its earthward flight, as the record indicated later, it overcame a force equalling three and one-fourth times the pull of gravity, which meant that the 17.500 pounds, which it weighed in normal flight, suddenly jumped up to nearly 60,000. Yet the place came through the ordeal without loosening a rivet or straining the wings.

Everyone knows that the wings bend in varying amounts as a piane rides through the air. I heard recently of a glider whose wing tips moved up and down through an arc measuring nearly eight feet, yet the craft is considered quite safe for flying. Airplane wings do not deflect more than a few inches normally, and to measure this deflection by observation only is impossible.

For that reason we carried into the air a motion pic are camera a telephoto tens pointed out a window of the passengers cabin looking arraigh out over the wing and focused on a fence ike detaile bothed thank five feet distant tigh by to the wing. This consisted of two apright stream used hodow metal tubes on which had been marked inches and fractions thereof to help our measurements.

We focused the center of the camera midway between top and bottom of the scales, Making sure the camera was bolted



knew would bring added strain to the wings. Later we had only to examine individual frames of the film to

read instantly the deflection up or down, in mohes. Nothing more accurate could be devised to measure during flight the give of an aurplane wing.

But the forces developed during variour maneuvers interest us only little more than he controllability of these high speed transports. A year ago planes plying the air lanes between the Adaptic and Pacific

Vibration areas incide the cabin are broken no an above, in this way, none has been eliminated. At right cabin done that in fastened at four points to keep the big ties arthusers norseless

faster than 200 miles an bour Eighty miles an hour added to the speed of transport planes in a singie year's development,

Like the modern automobile these ships must have a high degree of roadability Pilots have too many duties to perform to wear themselves out fighting the controls. Now we measure not only the forces required to move the allerona rudder, and elevator, as I have described to you, but we also determine

accurately the positions of he various controls and the resulting attitude of the plane

In my earlier years of flying, I looked on a flight as a single operation. I merely flew the displane from a standing start into the air and back down to a landing. Now I rease that the take off, the mital climb, the climb at higher astrudes, level flight and landing are separate and highly in lividualized undertakings.

I HAVE on my dashboard during tests a remarkable little instrument known as a position indicator. Its three dials record instantity and accurately the angle made between the elevator and the atabiliter,

the rudder and the fin, and the ailerons and the wings

We must now know, as the passenger ships dash through the sky nearly twice as fast as did their predecessors, how far the pilot must move his wheel to change the ship's position in flight, how hard be pulls and what happens.

These new ships possess stability to a high degree. That is, we can put them in a climb, a dive, a side ship, or in level right and fly them hands off for a long period of time. By ingenious daps attached to the control surfaces, I may change the ship a balance while flying high above the earth and can pull it out of that balance only by a stordy tog at the wheel



Instruments cover the dashboard of the newest and fastest transport airliners

the we actually can measure a plane's stability, which, briefly, means its tendency to return to its balanced position whether a dive, climb, or level flight. This requires expert piloting, a hand having the touch of a feather and the strength of a boser. The other day I took off in the hig Dotadas transport, the two engines pouring 1 400 horsepower into the three-bladed propellers, ready to test the ship for diving balance

Dive here does not mean as in the case of fighting planes a screaming drop through the beavens, but rather a mild glide with the noise a few degrees below level flaght. After reaching 10,000 feet 1 set the elevator flap for a five-degree

glide. We were at the moment flying 220 miles an hour and descending 100 feet a minute.

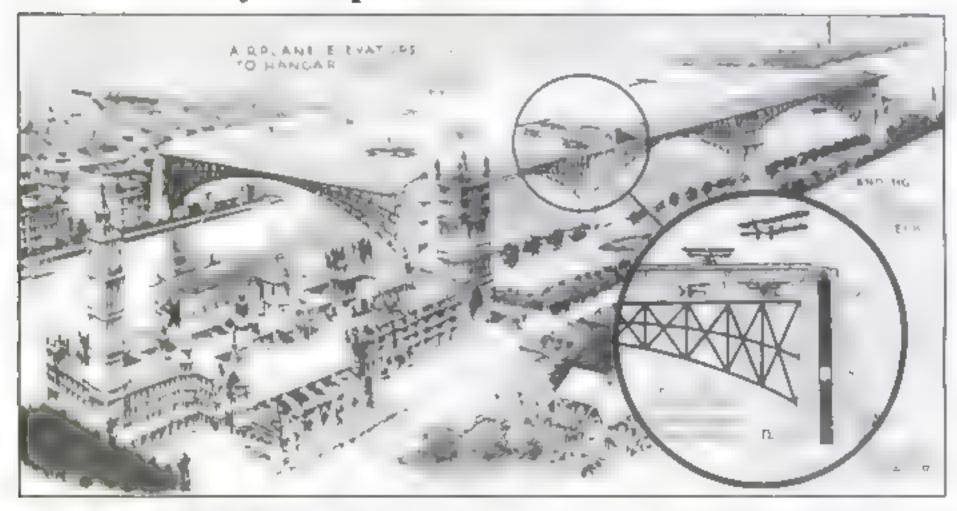
Thus we were balanced, even though diving. But how well was the ship balanced? I pushed forward on the wheel until the air speed indicator registered 240 miles an hour Having attained this added speed. I released the controls completely. Gradually the plane began to return to its previous glide, oscillating back and forth like a beavy penduum, Our speed varied from 240 muce an hour to 200, as it swung slowly up in a comb, fifty seconds later we picked up 230 ns st dove again; back to 210 . . . then 225 . . . back (o 215 . . . 220. And there

we continued our earlier line of flight.

WE EVEN measured the power exerted by the tany flap as the 220mits gale flew past its sleek metal surfaces. My arms exerted a push of forty pounds against the wheel, as measured by a scale, to hold the ship in a slightly steeper glide at a speed of 250 miles an hour

From these studies we learned what is known as the stability characteristics, which we can decrease or increase at will fe a plane is too stable, it may be likened to an automobile that will run smoothly down a country lane, yet will not turn easily when the (Continued on page 112).

# Plan City Airport Above River Thames



BUILDING a monster landing ( 1d over he River Thames is now being a second before officials of the city of Landin England as a money of provide the city of the ci

with an nirport close to its business center. The bridgelike structure, according to one plan put forward, would be high enough to clear the tallest masts of ships and would include an upper deck for landing and a lower deck with hangar space for planes. The diagram above shows details of the project

# Firefly Light in Electric Bulb

Glowing Minerals in New Lamp Remain Constantly Cool



Tirriw rett atte

MAGINET gluiv or the Homestedt's

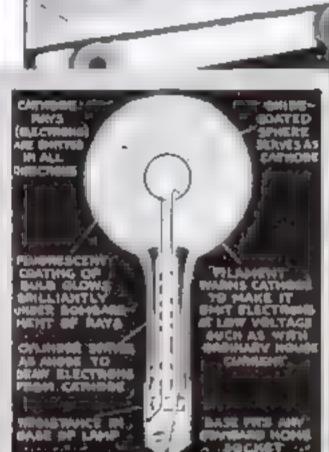
it k Brucklyn N Y., but paved the way for a new ar d of each ic ago mg for the home, he far the new hu b has

been produced only in experi-

and the same of the same

mental form, but designs for simiar mode a suitable for household use have been worked out and await practical test

Only in its shape, and in the fact that it may be installed in any home socket without change in the wiring, does the proposed new type of built resemble the incandescent lamp now used. Its light does not come from a white hot filament of metal, but from a glowing coat of minerals on the inner surface of the built. which is cool to the touch. The mineral



Light of any color, including white, may

coating becomes luminous under the bornbardment of streams of cathode rays, or electrons, which are emitted from a sohere at the bulb's center. When the bulb is used on low-voltage household current, a blament within the sphere warms it to assist in producing these invisible mys-When it is used for higher voltage, as for factory lighting and in advertising signs. this filament may be dispensed with

Close um of eak aral types of the glowing lamp bulb that constant, v roma on cool tap matter how long it is used He'd in the hand is an electrode used in these ghts when inatained in homes

er while find give a long to the contarg

v cestific world ump is that it teproght of the firefly and egarded with envy by note any workers was have tried at an to dealisate it. Expens cup edihat the test of lamp out is now in use wash to and or the cut. They turn of the carrent they consume in o heat, which serves no useful purpose and may become a positive nutrance. Research workers have lately been de-

Veloping lamps of other types, using tumunous columns of gas, in an effort to obtain greater efficiency, but the idea of using fluorescent minerals that, under an electric hombardment, glow without any beat is an entirely new solution of the problem.

The secret of the new lamp, according to Gilbert T. Schmidling, its inventor, is ile use of a new duarescent inixiare of exceptional brilliancy. Fluorescent materials in themselves are by no means new; in fact, about 11,000 compounds are known that have the curious properly of glowing under bombardment by various kinds of invisible rays. Examples are the paint used on radium watch dials, the Vitay viewing screens used by surgeons. and the screens of cathode ray tubes used in television receivers. Testing thousands of these materials to study their adaptability to television screens, Schmidling came by chance upon a mixture that furnished a light brilliant enough for working and reading. Trials proved it could be used in an electric lamp, requiring only about one sixth as much current as an ordinary bulb to give the same amount of bght

# · Vast Counterfeiting



.1

BY JESSE F. GELDERS

CROSS the counter of a Physide phia drug store, a customer who has hought a box of aspirin taulets, handed a one dollar bill. The druggist ex-amined the dollar critically, then smiled an anology as he sail

Can t be too careful. But this isn't counter-

No," snapped the customer, snspecting the little tin box he had purchased, "but this is-

He was an investigator for the manufacturers who had learned that their product was being taked. The containers bore their own name and trademark, and their name was stamped on every one of the hitle tablets. Let the aspirin had not been made by them!

The investigator, by inconspicuous errors on the box, had identified his purchase as one of the counterfests. He demanded to know where

the druggist had obtained i

Detectives were working with all possible haste to check the fraud before the spurious medicine was widely distributed. Through information from druggests, and by training satesimen of the fake product, they were able to round up members of the gang in Philadelphia and New Vork. They raided the gang a factory and seased boxes of the take medicine in powder form a pill-making machine, and nearly 2,000,000 dittle tm containers bearing the counterfe-ted name and trademark.

This episode, with variations, has been repeated over and over throughout the United States, during the last few years. Scores of manufacturers, besides the makers of aspirir have been given headaches by the crooks'

brazen plots.

Counterfeiling has grown to be one of the nation a major criminal industries. The counter or ng of real money is now far overshadowed by the counterletting of nultions of dolars worth of things of every imaginable kind. Not only the public purse, but health and sometimes even life, are jeopardized. Medicines, foods watches, stocks and bonus, marble statues stamps, razor blades, auto parts, and cigars are a few of the products that have been faxed,

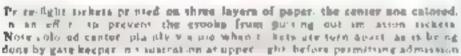
One gang put out \$2,000,000 worth of counterfeit shares in one of the nation's largest corporations. New York police trailed the counterfeiters of a popusar soft drink, and discovered a plant ready to produce \$1,000,000 worth in one summer. For one championship prize fight, some \$40,000 worth of counterfeit

tickets were sold.

With termendous values at stake modern science and mechanical ingenity are being called upon to check the depredations of the counterfeiters. Manufacturers are resorting to hidden markings, secret codes, and a new paper with invisible printing that shows up when dampened or held to a strong light. Museums

# Racket FLOODS MARKET WITH FAKE GOODS





and are co-sectors are protecting themselves from deception with ultra-violet light. X-rays, and many devices of chemistry and J 13 66 5

Unfortunately the role of science in this sensational struggle against crime is a dual one. It helps the crooks as well as the forces trying to thwort them. One invention provides a distinguishing mark to prevent andation. Another invention makes it easy to copy

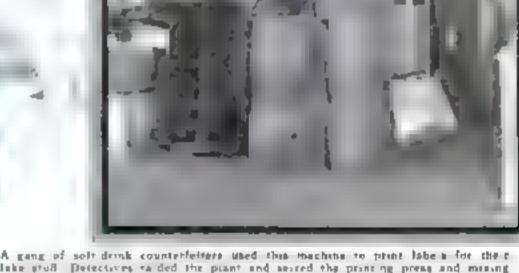
Recently the makers of a longased medicine received complaints Some of the medicine was provmg meffective, and moreover it was escoloring the users mouths Investigation disclosed that a fake product was being sold. The labels bore almost perfect copies of the long-familiar aignature that had always

been prominent on the genuine Not many years ago, the printed facsimile of a signature like that was considered a comparatively effective safeguard. But by photo-engraving it is no more trouble to reproduce a signature

than any ordinary drawing

For a time, a clever scheme foiled counterfeiters. Designs of labels and wrappings were printed in two or more colors. The colors had to be printed from individual plates, and once they were combined, the engraver's camera could not pick out one rotor at a time. It was a job like unscrambung eggs.

Then orthochromatic photography was developed it unscrambles colors. The orthochromatic negative, when exposed through a color filter makes it easy to reproduce the sengrate plates necessary for



lake atual Detectives to ded the plant and secred the printing press and mining tanks. At lest, the see mate consumer for whom, he bogus concection was invended

a multi-color illustration. It is a boon to legetimate engravers, but it is also just what the crooks needed

bometenes the photo-engraver may be in collusion with the criminal but often he is himself the vicum at deception

A few months ago a stranger brought a New York photo-engraving firm three fragments of printing, one piece at a time, to be comed. When the third apneared, the engraver discovered they were all parts of a certain canned food label. which had been cut up almost like a persaw puzzle\* A watch was kept for the man who had brought them, but he had become suspicious and never returned

One of the most ingenious systems to millify the opportunities which photoengraving has given the crooks was developed after a spectacular fraud. The promoter of a championship prize fight discovered, when the preliminaries were about to start, that 1,000 speciators had got into the \$40 seat section with counterfested tickets. Even if the fakes could have been separated from the genuine. It was out of the question to put out 1.000 men, most of them probably innocent marchasers from the crooks. Hurried changes, scats at the aisles, and diplomacy were accessary to prevent that champronship prace light from being preceded by a battle royal among 1.000 scatless fans who had bought good tackets

Afterwards the promoter asked a ticketprinting organization to devise a ticket

more difficult to counterfeit

The printers considered the tools at the disposal of the crooks, when they planned the new style. Precautions start at the mill which makes the cardboard on which the (Continued on page 114)

# Experts Seek Way to Save



# Plan Light-Tight Vaults and Archive Building to Preserve

# By ROBERT

STHE beam of Washington, D. C. a gr v low stone banding is nearing completion. It forms the latest answer of science to the age-old problem of preserving records.

known as the National Archives Building, it will house within its five stories and 450,000 square feet of floor space the precious documents and records of the Government. Automatic machines will maintain the 4,000,000 cubic feet of air within its walls at a constant level of humidity and temperature. Since a adiabate sprays will remove atmospheric across Lightight values will protect ancient papers. They be deteriorating effect of daylight, Glazed tile and non-rusing metal will cover the hours of the recommendations of the U.S. Bureau of Standards, it embodies the latest ideas in document preservation.

I also represents the newest ank in a long chain of court that stretches in k to be corner, days of interior. Men of all ages have grapped with he problem of leaving beautiful records that were leadure.

Lave men left crude drawings of the arms they saw scratched on the walls of their care too Viavanos, in their amazing empire of 7,500 years ago, cut hierogy opines in stone pillars and temple walls. Along the Nie Experian Pharaoha set their slaves to erect the gaste pyramids which formed their tombs and record viable. According to the Greek historian, Herodotus, 100,000 men labored for nearly thirty years to build the Great Pyramid of Cheops, which, more than 5 too years ago, was nearly hill as tall as the lamping State Building, the highest structure in the work today.

In Babylonia and Assyria, men kept their records on tablets of clay. They imprinted the characters of cuneiform writing in soft material and then baked if to the hardness of stone.

A few months ago, archeologists working among the rules of Erich, unearthed 1,000 of these tablets which have just been translated by Prof. Raymond P. Dougherty, of Goucher College, Baltimore, Mr. He found they represent the office files of a Babytonian temple, showing bookkeeping notes and business transactions. Some of the clay tablets were found to be the equivalent of modern checks made out for payment to the bearer

Probably the most inviterious of all the oncient records that archaeologists have encountered lies on a lonely dot of land 2000 mites out in the Pacific from the share of South America. Easter Island, an engine containing forty five square miles, is timed by more than 600 giganite statues, each representing a human face from thirty to seventy feet high. Scientists estimate these products of artisans of some long-forgotten race are from 2,000 to 5,000 years old Inscriptions which accompany them are in an unknown language that still baffles the experts. A possible clue has just been reported by a French scientist. He has found that the hieroglyphics bear a strong resemblance to ancient markings found in the interior of India

As civilization advanced, new forms of record keeping appeared. The Greeks, although her ake the Egyptians often wrote on thin sheets taken from the papyrus plant, set down their laws and public accounts on tablets of bronze. The Romans recorded important

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# World's Vanishing Records

# Alkaline Sprays in National Nation's Precious Documents

## E. MARTIN

laws on stone or bronze and less important records on papyrus, parchment made of animal skins, or on tablets of wood covered with wax. During the Middle Ages, monks laboriously copied in longhand whole ibraries of books, using in place of paper, vellum, fine parchment obtained from the skin of young animals. The invention of paper, more than 2,000 years ago, is credited to a Chinese high official, Tsai Lun

Recently, experts of the U.S. Bureau of Standards tested a piece of paper manufactured in China fully a century before Columbus discovered America Its fibers came from the inner bark of the mulberry tree, combining great strength and softness. More than 600 years old, it was as strong as modern paper produced by the latest methods

With the invention of printing about 1430, a new era of record making big in leading to the modern high-speed press and the knotype. Wood-pulp paper and girnt presses now make possible the cheap daily newspapers and widely distributed books which are a vital part of Twentieth Century civilisation.

But as the speed with which written records can be set down has increased, the durability of these records has diminished. Newspapers yellow and cromble in a few years, magazines have a life that is measured in decades; books soon succumb to sunlight and acids in the air. Should some blight sweep over the world, killing all the civilized races, the printed records left behind would last but a few centuries.

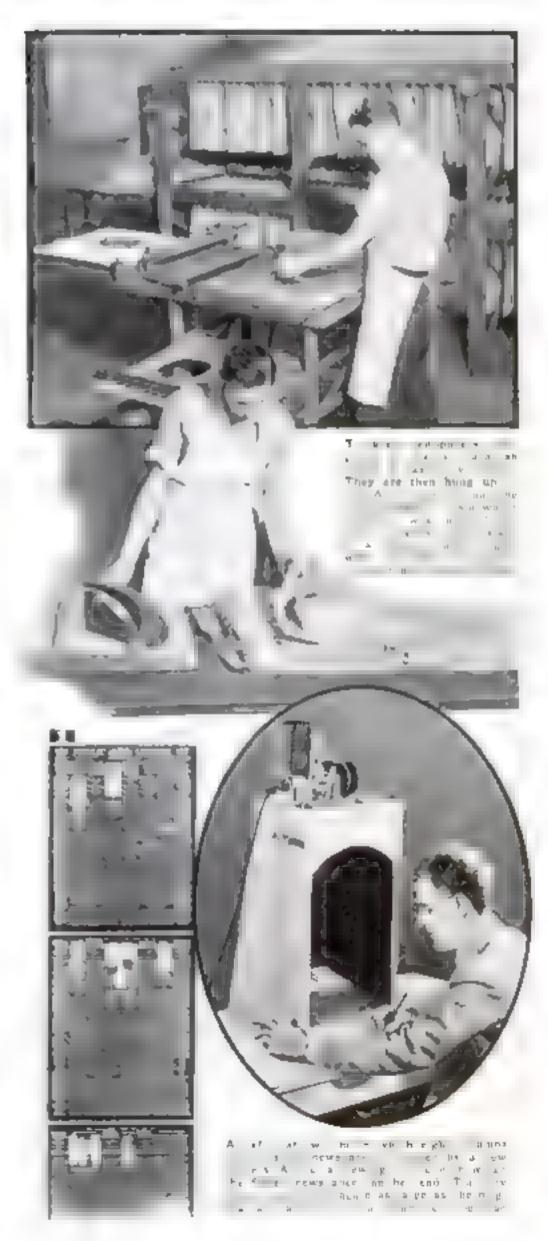
In Denver, Colo., a project was recently announced for placing a thousand books and other papers, which would give a history of our civilization, in airtight copper boses to be stored in sealed vaults in which they would last for thousands of years. A similar project has been started in Ackansas by "Coto Harvey the picturesque middle-westerner whose monetary pain figured in the first Bryan presidential campaign. Near his home, he has been constructing a pyramid in which he plans to place records of our times for future generations.

Thousands of years hence, what would archeolograts find in exploring America? What records of our crydication would remain the longest?

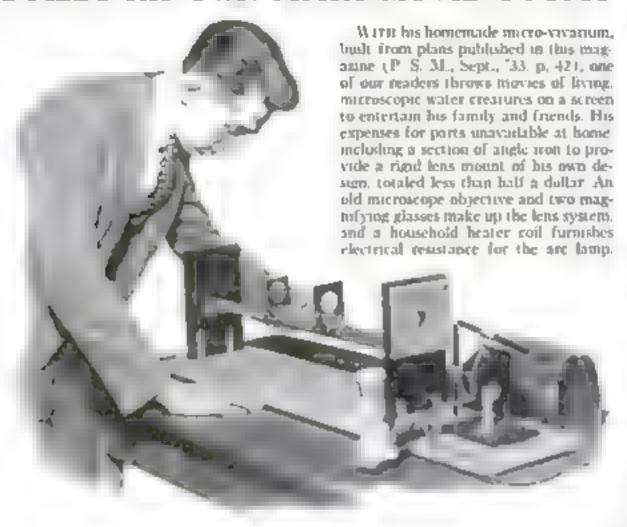
That question was brought up lost year at a meeting of scientists in London, England. In 5.000 years, they concluded, our steel and concrete skyscrapers would have crumbled into dust, our blearies would have disappeared; our machines would have disappeared; our machines would have disappeared and become part of the soil. The best clue to our civilization which archaeologists of a remote future would have, one expect maintained, would be the costs which are deposited in corner or foundation stones of public buildings.

Unleasted verthe handwork of our generation which will endure longest of all is the carving being cone on the face of Stone Mountain in Georgia and in the Black Hals in South Dakota. It is estimated that the gigantic faces of Washington. Jefferson Lincoln, and Theodore Roosevelt, being cut into the granite of the Black Hills under the direction of the American sculptor, Gutson Borglum, will last for more than 500,000 years.

However, the problem which is most concerning scient its in connect on with records is not their preservation for archaeologists (Continued on page 11).



# BUILDS HIS OWN MICRO-MOVIE OUTFIT



This homeomade buccow yer up by felicit a total coat of lose than fifty coats, is used to throw by ng moving pictures of micros opic water creature on a screen in he liter's home

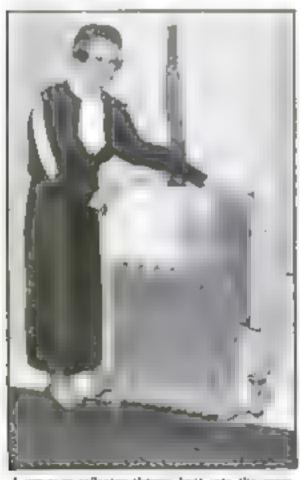


## SUNSHINE FROM ORIENT MAY LIGHT OUR NIGHT

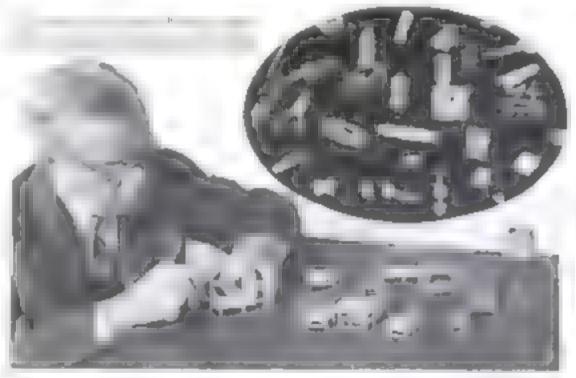
Pierve sunaght around the earth from the Orient to illuminate New English homes at might is a possibility predicted by Dr. Alexander Silverman, University a Pittsburgh chemist, if a cheap way can be found to manufacture fused quarts from beach sand. Rods of this glass ke substance, because of their curious powers or internal reflection, can conduct light ground comers. The photograph above shows the largest block of fused quarta yet produced

#### RADIATOR REFLECTOR DISTRIBUTES HEAT

Mone heat from your radiators, without increased fuel cost is said to be provious sy heat bouncers recently placed on the market. When these sheets of highly-polished aluminum are slipped into place, one to a trader or bessale that otherwise with the war or presenting to wall, and reflect to a the room. The n flectors, as a section to be just are business. materials material of the self to personal no special mourane



A um num reflector throws best into the room



# U. S. OFFICIAL HAS MANY HOBBIES

Hossytst extraordinary is Dr Edward Grant Dexter chief of one of the divisions of the Veterans. Bureau at Washington, D. C., whose bome hear the White House serves him as a workshop for his varied off-hour pastime. One of his creations is a himemade refracting telescope fashioned from a discarded microscope and a cardboard mailing tube, another a collection of forty walking sticks that he has carved by hand from rate wood He holds a patent on his own original process of forming a silver-mounted cup and succer from a coconut. Transforming an ordinary match, by whittling, into a fantastically intricate sece of woodwork provides him with one of his favorite diversions. A pnemere chain of eleven links, carved from a single match stick took him only eleven minutes to complete. His collection includes match-stick models of phers, dividers, tongs, and binged rules. One of his masterpieces is an accurate model of a piston so small that its working parts are practically invisible. Held in one hand, the frague instun may be slid back and forth within the wooden match that represents the cylinder Remodeled dissecting knives are his tools.

# Below, Hintshing first scale model of a brus tossurus in action fit wall he reproduced an concrete, 40 feet high

# STATUES OF EXTINCT MONSTERS TO BE ERECTED IN CITY PARK

Life-size reproductions of the brontosaurus, or thunder lizard, and fourteen other monstern of prehistoric ages, noon to be erected in a park at San Diego, Calif., will give visitors a starting glompse of these extract creatures. The first of the scale models, depicting the brontosaurus in action, has just been completed by Fred W. Temple, duplay engineer. Its full-size counterpart will be of reinforced concrete, and will measure forty feet in height and between seventy and too feet in length.

# TRAVELING LABORATORY HELPS FIGHT SILKWORM PESTS

Livrie competition troubles M. Paikot, French horticulturist and silkworm expert, in his specialized profession, for he is the owner of what is, perhaps, the only traveling silkworm laboratory in Europe. Each year he tours the silk-growing sections of France in his elaborately fitted automobile workshop, patieng wherever disease attacks the worms or plants to make tests and trace the source of the scourge. Built-in enjoyment of an unusually compact design enables the research expert to perform extensive chemical experiments and microscopic examinations. His services are said to have saved fortunes for the growers in the silk-producing districts.



In the care equipped for chemical and microscopic examinations an expert visits the still growing sections of P and and fights at first hand the destructive pasts that a tack of two the and mathematical trees.

# START RESEARCH TO END SKIDDING

BRITISH government scientists have established a laboratory for research on skidding. In one of their tests, a maniature automobile chassis with one set of its wheels locked is catapulted along a model.

road, while a chart records the extent of its akid. A motor cycle sidecar, with a hinged wheel, is used in a corresponding test. The wheel is locked while the machine is moving and an automatic recorder registers what happens. The experimenters hope to develop anti-skid road surfaces,



Above, change of model car and, eight, motor cycle used in cents to end skidding



# FASTEST TOP HITS 1,390 MILE SPEED

Whitely o so rapidly that its outer walls travel at the amasing rate of 390 miles an hour the fastest top in the world was exhibited in New York toy the other day by its designer frot J W Beam of the University of Virginia Jets of hydrogen gas impange upon its fluted under surface supporting the pen-sued rotor of toughened steel and spinning it at terrific speed. Its use in the laboratory for tearing apart biological specimens, and for measuring the speed of light, is proposed. The picture above shows the top resting on a finger tip.

# New Sub's Hull Plates Biggest Ever Used

Now undergoing its first sen tetals, Uncle Sam's newest submarine, the 260 foot Cachalot, represents a new departure in submersible construction. Her half plates, largest ever used for this purpose measured about fourteen by twenty-four feet and were shipped in special cars to the Portsmouth, N. H., navy vard. Here they were formed in rings, like the one shown in the filustration, and the seams were joined by weiding, making the Cachalot the first welded under-water craft. This me had decreased the weight of the half and pro-

vided more room for officers, crew and equipment. Naval experts declare that the use of the oversize plates and welding will reduce the rost and speed up the construction of submarines

Above, section of new aubmarine's bull during construction. Right, the out in sec test

# DOUBLE HOBBYHORSE RUNS IN CIRCLE



This double hobbyhorse moves in a circle when enched

Designed on a new mechanteal principle, a merry-go-round hobbyhorse has just been introduced to provide fun and exercise for two children at once. Sitting facing each

other astride the rinake believe steeds, the young riders by rockiest back and forth, can make the device describe a complete circle Each horse advances a few inches as the wheels mounted upon it come in contact with the ground forcing it ahead.



PLASTIC METAL FINISH

t sept's as a metal finish and as a rust preventive, a plastic material suitable for coating such objects as metal hatchet bandles and gun barrels has been introduced. The preparation is applied with a timbe and when dry is sanded and rubbed to a glossy finish. It then feels like wood and looks like metal

# BY BURIED LAKE

WARNICK, England, may be to danger of sinking into the ground and disappearing, bince one of the municipal tennis courts suddenly dropped into a mysterious body of subterranean water the aldermen and citizens of Warwick are plarmed at the possible fate of their city. Investigation revealed a buried lake, formed by an underground river that runs the entire length of the town. The illustration at right shows laborers engaged in pumping out the water from beneath the lost tennis court as a first step in the necessary protective measures.





#### NEW VACUUM TUBE FOR ATOM SMASHING TESTS

FOLLOWING successful trials of their new 7,000,000-volt generator in a dirigible hangar at Round Hill, Mass. (P.S.M., Feb. '34, p. 19) scientists of the Massachusetts Institute of Technology have been casting about for a sontable tool to use in applying its terrific power to atom smashing. Now that tool appears to have been found in a new type of vacuum tube producing an unusual abundance of highvelocity probins or positively bargehydrogen nuclei, for bombarding atoms The new atum gun, shown above, produces an electric are between electrodes operating in hydrogen gas. The attempt to shoot the stom to pieces will be made in the belief that, in this way, the enne mous amount of energy, thought to be stored in the atom, can be released. The answer to many of nature s buffling secrets. in ght thus be discovered

# GIGANTIC RADIO STATION HAS 500.000-WATT POWER

VEXRIN completion as this issue went to press, the world's most powerful radio transmitter will soon be heard by fans listening in on the 700-kilocycle channel between one and six

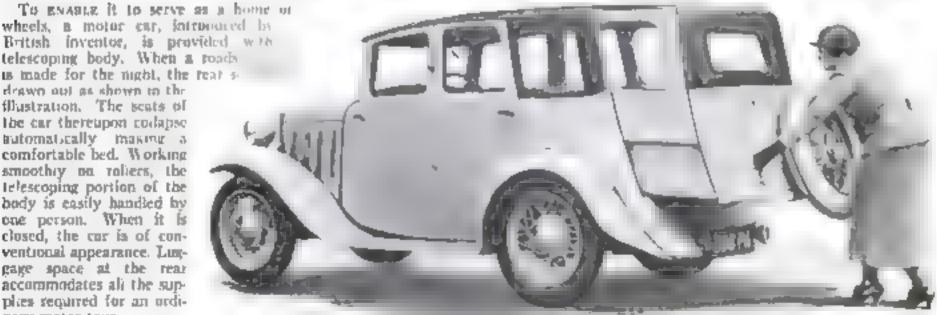
A.M., Eastern Standard Time, Permission has been granted station W.W. Concurnati, Ohio, to install the set and conduct experimental broadcasts with its full 500 000-watt power which is ten times that of any commercial broadcasting station in the country. Its normal service range will be 2 .00 miles, and under favorable conditions it is expected that tisteners anywhere on the globe will be able to pick it up. A million gallons of water a day will cool the tubes of the mammath transmitter. The largest audio transformer ever buil, weighing 100,000 pounds, is a part of its equipment. The trials will test the theory of its builder, Powel Crosley Jr. that such mighty power can be buried into the ether without interfering with local stations, and that it will successfully override all static in carrying clear programs to listeners for outside local broodcasting areas



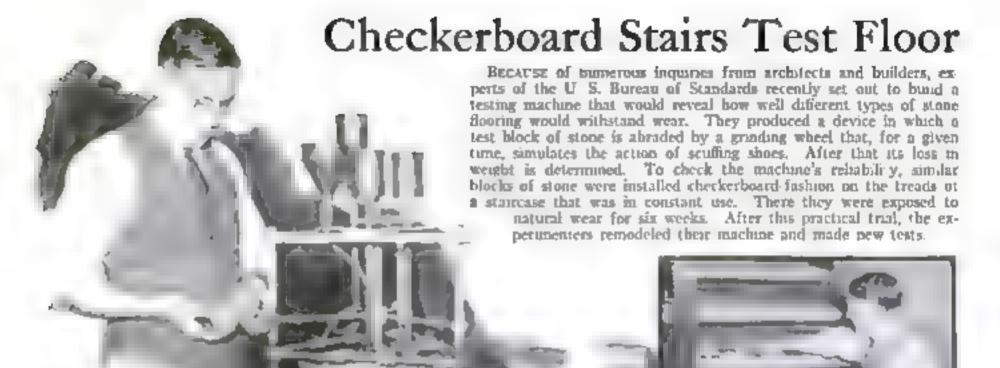
This 43 foot very all america will transmit broadcasts from the world's most powerful radio station. Inser ahowe the meter control panel to be used during in till thats

# CAR'S TELESCOPING BODY PULLS OUT, MAKING ROOM FOR BED

wheels, a motor car, introduced by British inventor, is provided with telescoping body. When a roads is made for the night, the real so drawn out as shown to the flustration. The scats of the cur thereupon codapse automatically making a comfortable bed. Working smoothry on rollers, the telescoping portion of the body is easily handled by one person. When it is closed, the car is of conventional appearance. Luggage space at the rear accommodates all the sup-

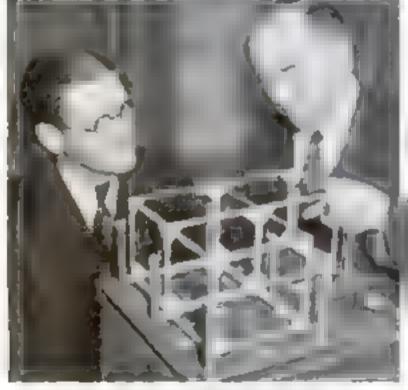


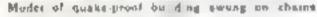
nary motor tour



Above, machine used in tenting atoms flowers at the U.S. Bursay of Standards. At the right checkerboard states but to use to gage arouthey of dark secured by mechine

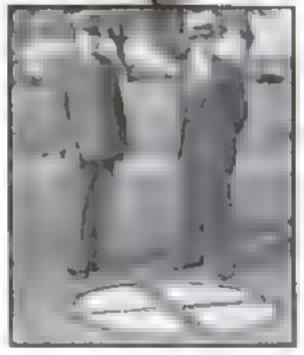
SMALL ELECTRIC MACHINE GAGES POWER OF WAVES





#### QUAKE-PROOF BUILDING TO SWING ON CHAINS

HANGING an entire building on chains hooked to supporting columns, to guard it .rom earthquakes, is the unconventional idea proposed by a Los Angeles, Calir inventor. In his plan, the steel skeleton of a building would be provided with projecting members at its base, which would be devoid of the usual massive foundation. Instead, chains attached to the projecting parts would suspend the but the bound from a single of the green surroundly us cater wells. Such a structure, the inventor maintains, would not be subjected to destructive forces during an earthquake, since it would swing freely like a pendulum at every shock and would , has yield to the earth movement instead of resisting it. If desired, the whole sunporting system of piers and chains could he placed underground.

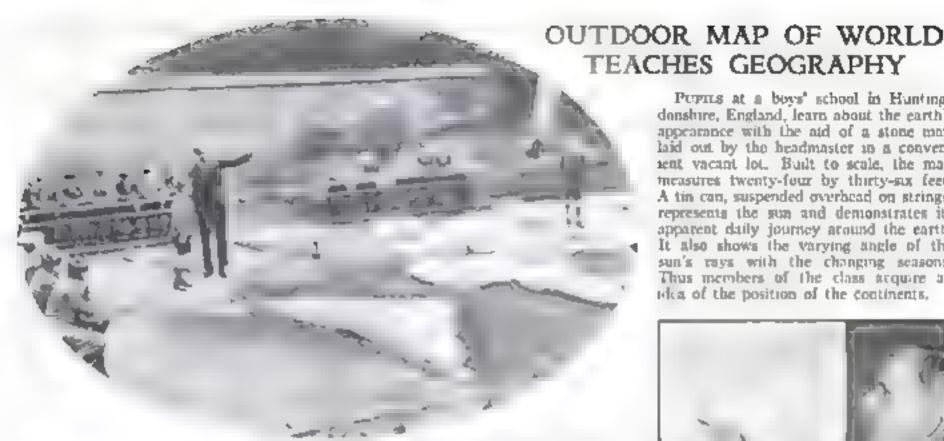


Black cross, painted inside circle, marks the scene of an auto accident and warms drivers

Huge rocks and other objects moved by ocean waves testify to their devastating power, but it remained for government engineers to find a more exact way of estimating their force. To learn the amount of huffeting to which piers are subjected, the engineers suspend a set of diaphragms in the path of the waves. The force of each wave is registered electrically in the oscillograph pictured above

# BLACK X MARKS SCENE OF FATAL CAR CRASH

SEEKING a way to reduce auto accidents. Chief of Police N. Matlock, of Phoenix Ariz, has put an unginal plan into effect. Each time a fatal accident occurs, the exact spot is marked with a black "X" on a white background encircled by a red ring. The marks warn motorists against reckless driving



PUPILS at a boys' school in Huntingdonshire, England, learn about the earth's appearance with the aid of a stone map laid out by the headmaster in a convensent vacant lot. Built to scale, the map measures twenty-four by thirty-six feet. A tin can, suspended overhead on strings. represents the sun and demonstrates its apparent daily journey around the earth. It also shows the varying angle of the sun's rays with the changing seasons.

Thus members of the class acquire an idea of the position of the continents,



# LONG-RANGE FORECAST **GIVES 1948 WEATHER**

First tentative long-range predictions of the weather, including a 1939-1948 dry spelt for central Nebrasias, have just been made by Dr. Charles G. Abbot of the Smithsonian Institution, following his recent discovery that the weather repeats itself every twenty-three years. At right, he shows how recent Bismarck, N. D. weather bore out his predictions.

# AIR PUMP RAISES PNEUMATIC TENT



You pump up, instead of set up, a pheumatic tent recentry displayed in London, England, In place of the customary center pole and gay ropes, the shelter has a framework of air-tight cloth tubes that can be blown up with an ordinary automobile pump when the camping site is reached. When it is erected, the tent is aix feet high and seven feet square, Deflated it fils in a value

# LIGHT THROWN ON ROAD TO SIGNAL CAR'S TURN

A PRENCH inventor has come to the aid of motorists traveling after dark by signing a signal based on the princips, of a magic lantern. Thus it projects a woming in illuminated letters, upon the pavement behind the vehicle. In this way the intention of the driver is unmistakably aignated to any following car and, it is said, no misunderstanding is possible The illustration above shows the appearance of the new signal as it displays the French word "doubles," indicating a turn

# NEW STEAM LOCOMOTIVE IS FULLY STREAMLINED

KEEPING pace with the development of stream, med gasonne and Diesel-powered rail vehicles, a leading American locomolive works announces that it is now ready to supply steam focumotives with the

rante speedy lines. The engines will be capable of two-mile-a-minute speed or more it nested. One of the restal designs, shown below, completely encares the locomotive in metal sheeting to cut

wind resistance. A compact amoke deflecfor serves the same purpose as the large side shields used on European engines and the cowl atop the boiler encloses sandbox, dome, bell, and whistle.



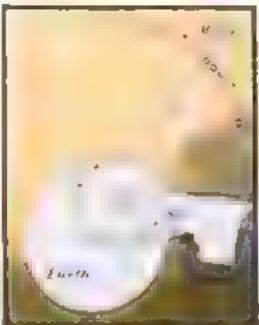
# Simple Experiments Explain

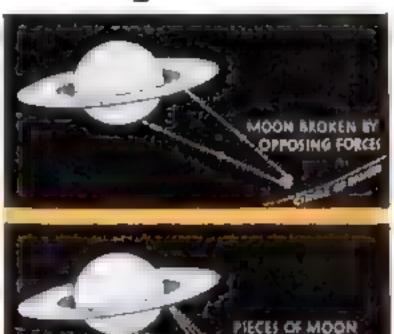
# Saturn's Rings

AND THE

# Canals of Mars









# BECAME A RING

Three views above give a clear idea of how Sain in a roson, having been drawn by giving straining to the planet was destroyed by contending forces, couched to powder, and set whiching in a ning of due, around beginn

# By GAYLORD JOHNSON

LR made the great Dutch astronomer. Christian Huygens, disconcreted in 1656 that the planet Saturn is surrounded by flat rings these unique objects have excited wonder and curiosity. No other planet has hem, how were they caused?

After the telescope had revealed the nine moons of Saturn, some astronomers suggested that the rings were another saidline in process of formation. This however, has proved to be the exact opposite of the truth. The rings are now known to be the smashed-up debris of a former sate-like.

But what fitance power was equal to cracking up and pulvertaing a moon that must have been even larger than our earth when the catastrophe occurred.

The answer given by modern science is simple. The attraction Saturn exerted upon its moons throughout millions of years gradually slowed down their revolutions and drew them nearer and nearer to the planet. Eventually a point was teached by the nearest moon at which its particles were being pulled in contrary directions by the masses of matter on opposite sides of the enormously larger body of Salarn.

When the moon could no longer resist



The two illustrations above show how the rings of Saturn map have been formed. In the upper one, two piles of fon fillings are being brought close to a horseabor magnet. The lower one above how the fillings are drawn into a line by the two pules of the magnet. Thus gravity wrecked Saturn's thoose these strains, it broke into several parts—and later, as the parts approached the planet still closer, they were split again and again. In this way, the contrary gravitational pulls of Saturn pulverized to nearest moon and converted it into a whiring may of dust,

The point of pear approach at which a moon begins to be in danger of being pulled apart by its parent planet was calculated mathematically by the scientist R whe, and is now known as Roches have

This circle of danger is at about two and a half times the planet's diameter away from its surface. Accordingly when our earth's moon has been drawn within this distance, that is about 20,000 miles from the earth, it will be broken up and form a ring around the earth. Of course the time at which this will occur is almost infinitely remote

Astronomers say that the moon. Mimas which is now nearest to Saturn, is alteredy dangerously near to Roche's lim. Therefore in a few million of years, it may be torn to pieces and form another ring around Saturn.

The process by which a planet pulls its moons apart at Roche's limit can be illustrated by a sample experiment with



The upper of the two figures, tell above, wendrawn by Schiapperald, an autronomor who believed he had seen canale on Mars' surface. The other figure was drawn by an astronomor who thought the canale (magnary and not the work of interlugant beings

In circle in a typewritten model of Maraannaisting of a disk of paper covered with typed fetters and having Martian acts and lakes indicated At top, looking at this model with half closed eyes and seeing "canals" caused by the lotters running together

which these scientists hase their conclusion that there are no cana's

Put a sheet of white paper in your typewriter and cover it with letters written haphazard, the lines being single-spaced. Then from the typewriten sheet, cut a circle about seven inches in diameter. Mount this on a black square and add a white polar cap. Also indicate roughly, with black ink and a water-color brush, a few of the principle Martian seas and lakes.

You now have a crude model of Mars, as viewed through a telescope, which will enable you to see some of the canals

To do this, set up your typewritten map of Mars, half close your eyes, and back slowly away from it. When your vision of the individual letters becomes indistinct, stop and stare fixedly at the disk of your planet. In a few seconds you will see straight dark lines begin to shoot across the type matter from the round lakes to the points and projections of the beg sea. These lines will come and go and vary in distinctness, but they will strongly suggest the canala drawn by Schiaparelli, Lowell, and other astronomers who thought they saw them.

According to the theory that is now gaining acceptance, the canals are termed by the astronomer's eye, which connects together into lines the details of the Martian surface which are too indistinct to see separately, just as your eye does with the Individual typewritten letters. At this point some one may say, "But the canals have been photographed! Doesn't that prove their existence?" The answer is "No," for the lines appear just as dissinctly (Continued on page 1986)

a horseshoe magnet, a pinch of iron filings, and a bit of smooth, then paper

In this experiment the field of force around the poles of the magnet represents the gravitational attraction of the planet

Place two tiny round piles of iron filings on a sup of paper, about balf an inch aport. Each pile should be a more pinhead in oue.

Then rest the paper on the poles of the magnet and move the first dot of iron filings slowly loward the magnet

In a moment the pile will be pulled apart toward both poles of the magnet and will form a thin line of himes. As you move the second dot of iron filings toward the magnet's field, it will be split in the same way

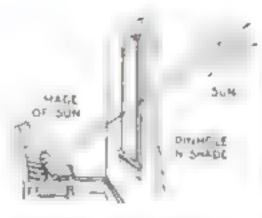
The planet Mars has provoked more discussion than any other of our neighbors in space, and this interest has centered largely upon its so-called canals

These long, straight markings were discovered in 187, by the Italian astronomer Schiaparelli. The American scientist Lowell gave many years to their study. Lowell declared the canals to be vast irrigation ditches, dug by Martian engineers to distribute the scanty water supply of their planet.

Astronomers of today are not so sure of this. Many of them now believe that the canals of Mars are not only not irrigation ditches but are merely optical alustons and do not actually exist

An experiment easily performed will give you a part of the evidence upon

# Pocket Rule Gives Sun's Size

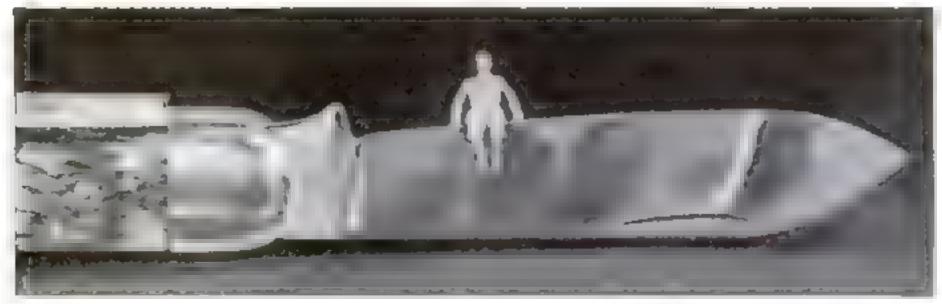


HERE is a simple way to measure the sun's diameter with a pocket rule. The experiment should be performed about 9 A.M or 3 P.M. Make a pinhole in the window shade at about your own height. Draw

it down so the ray of sunlight coming through this tiny hole will throw
an oval on the floor. Set up a sheet
of white paper so it is exactly at
right angles to the ray of light. Make
we parallel marks on the paper, inside the beight circle. Move the
chair toward the window until the
disk exactly fits between the marks.
Measure the distance between the
marks with a rule reading to sixty
fourths of an inch. Measure exactly



the distance from the pushole to the center of the disk. The distance of the sun from the earth is 93 000,000 miles. If the second distance is 10 feet \$4 inches, and the first is 1 175 makes, you get this proportion, 125.4 makes 1175 93,000,000 t X. The value of X comes out 8 1,000 miles, which is only sughtly larger than the true diameter of the sun as determined by astronomers who use much more refined me hods.



If a man were the size of a dy, he would be so light in proportion to his surface area that he

# IF YOU WERE could six on the edge of a lenife and not be cin Knee High to a FLY



To a man only one eighth of an inchita'l, an insect would be as dongsrous as a sizer is to a purma shaed man. Its sting would undoubted y cause the m dark a costan death

AN'S principal fear, oddly enough, is caused by the thing that makes most of his engineering feats possible—the attraction of gravitation. In other words all his ofe he is terribly afraid of falling.

Psychologists say this fear is the one thing a child does not have to learn. A very young baby will cry in terror if allowed to fall backward upon its pillows.

But an ant, or any other insect, never needs to dread the effects of gravitation. If you could be reduced to its size, you also would be freed from this terror Because of the great reduction of your weight, and the much smaller decrease in the surface area of your body, the mr resistance would buoy you up. If you were to fall from the top of the Empire State huilding you would be so well supported by a cushion of air that you would reach the ground uninjured. Due to your al ght weight you could sit upon the edge of a razor-sharp loufe brade without being cut

Also your weight would enable you to use a spider's web for exercise in climbing. You could go up it like a cope hidder. or go hand over hand along its cables, for you would weigh no more than the spider Due to the difference in specific gravity you could stand upon a drop of quicksi ver warhout sinking into it

All of these things are caused by the operation of a law of matter that was first fully explained by the great Italian scientist. Galileo. Here is the gist of it the weight varies as the cube of the length, and the surface varies as the square of the length

Put in place English, this means that if you divide a two-inch cube of marble by three saw cuts, so that you have eight one-inch cubes, each of the smaller cubes

will have one fourth the surface area of the large one, but only one eighth of the volume or weight

If one of the one-inch cobes is similarly divided. into one-half inch cubes each of these will have one sixteenth of the surface area of the twoinch cube, but only one sixty fourth of its weight

Continued division would eventually reduce the marble to a fine powder that would float in the air (P S. M April, '31, p. 60.1

If you are a man five feet, six inches tall and weigh 150 pounds reduction to a one-eightle

inch height would mean that you would weigh only a little over half a grain or about 1,800 of an ounce avoirdupois.

This weight, compared to your surface area, would mean that, although you would have no fest of falling, you would become punic stricken at the thought of wind. You would be blown off your feet by even a moderately strong breeze

You would be so light that, if your body were oiled, you could float on the surface of water without breaking through its film, as a fine needle can be made to do

But the great decrease in your relative weight would give your muscular strength far greater powers. You could jump several times your own height. You come life onjects much larger comparatives). Then you can in your normal like This exide us the apparently phenomen I scrength of used's and much of their

As a one-eighth-inch man, the insect which you carelessly step on now would



Wind would be a real terror to an inject-steed man as the alightest breeze might blow him away as it does the leaves

become a real terror to you. A bee or mosquito would be as dangerous as a timer in the jungle. A sting would cause dea h.

One of the most interesting changes in the world, you would it emines and it high man would have to do with wall if you stood at the edge of a tiny pool, he was a wind curve downly if away from you, due to the rise of the liquid shrough surface tension, on the sides of he container

If you went in for a swim, you would have to take care not to be pulled vinleady toward the aides of the swimming pool, as a floating match-stick is in a cup of water. If another swimmer were in the pool with you, approaching him too closely would result in the two of you being drawn suddenly together

If you entered the pool with a lump of comphor held behind your back, you would be propelled through the water like a motor boat, due to the lessening of the strike tension of the water behind you. To see this effect attach a little piece of comphor to the rear of a ball-inch-ning paper boat.

A drop of water spilled upon the floor would curve up in front of you knewly, if you stepped into it, the surface tension would draw the water up your body above your would, and when you tried to waik out you would not find it easy. The surface-film of water would hold you on if it were sticky to uses.

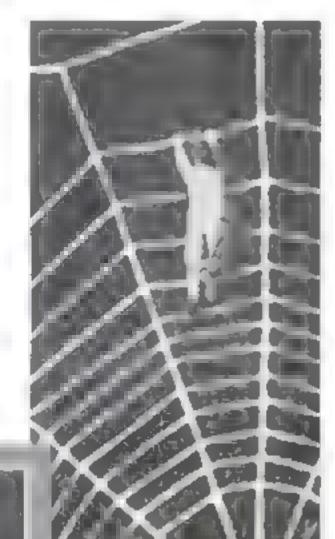
On the whole, life in the lampation world would have fully womany duadvantages as advantages and you might be more than will us to resume your normal size. This is spite of the fact that ice on the sidewalk is now a real danger to you as any facinety be serious.

One advantage of the L Popu an man would be his own haight a nee the er would have be support bim

Harp Knife with No Danger of Being Cut



Judging from the intercts, a fly high man will be able to carry a much heavier ousect propers onarally then he can now



Since the I die man would weigh no more than a spiter he outdi to mb a spider web I ke a adapt



Water in a tank would to an ensert man states down away from him as surface tens on who dies nother was girly around the edges of the tank.

Due to his gress so ace area and I ghe weight the midget child flow not the surface of water without breaking his finesage, you water without breaking his finesage, by as a size need a will float on top of a cup of water.

If a tiny men stepped into a drop of water it would in stantly rise around him, probably as high as his waste

# SHOWS

Prof G L. Preeman, psychologist at Northwestern University uses this big meighing maching to observe the minute down hard changes that occur in weight of subject, ying on the couch TOGGLE JOINT CUTTER FASILY CUTS TREE LIMB

# USE ONE-OUNCE DEVICE IN TESTING AIRPLANES

Weighted less than an ounce, a tiny testing instrument has been developed to measure pulling, pushing, and twisting strains in aircraft parts. Used during their manufacture to insure safe design, it records just how much each one will yield under varying loads by writing its own autograph on a moving steel steip. The strips are read by means of a nucroscope or photomicrograph. Other applications for the new instrument are foreseen in testing the members of skyscrapers and bridges, the framework and plating of ucean liners, and all types of machinery

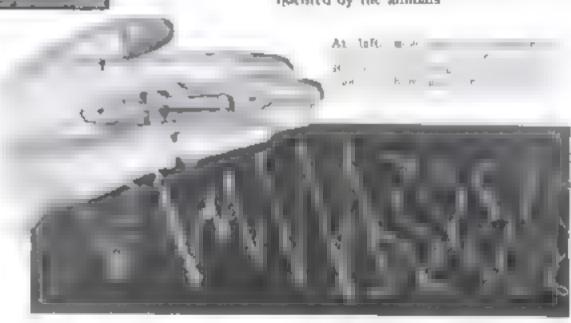
# GIANT WEIGHING MACHINE SHOWS CHANGES IN MAN

Using a giant weighing machine to support a couch on which a subject in lying psychologists of Northwestern University are studying the change in an individual a weight from minute to minute, as well as his varying pulse rate and other factors that affect his working efficiency. In one screen of tests, the scientists obtained definite figures to refute the superstition that the position of sun, moon, or planets in the sky has the slightest influence upon human activity. The changes, they say are due to man's environment.



# FOOD FOR WILD ANIMALS SENT BY CABLE RAILWAY

A CABLE railway was the unusual means of transport presser in a service he other day to rosh food to serving wild game in the Lat en Mountains of southern Germany. Bales of hay were fastened beneath the aersa; carn, as shown above and dispatched to the mountain tops to serve as forage for the woodland animals, which were facing famine as the result of the unusually severe winter. Government officials superintended the loading of the fooder and its distribut on in bounts frequented by the animals.



# 

# TOWERLIKE HOTEL HAS NO TWO ROOMS ON SAME LEVEL

fowering above the sucrounding country like a lighthouse, one if the strangest of hotels has just wen opened at Sestrieres, in the Italian Alps. Not only does its lower contain no stairs, but no two rooms are on the same level, to the center of the structure, an men well extends from top to bottom and accommodations for guests re provided in rooms surrounging his well. To give access to the recens, a continuous sorral ramp encircles the central west. This otly sloping walk makes fifteen volutions in the course of its it and the entrances to fifteen some open off from it during each orquete turn. Its winding form gives it a striking aspect when viewed from one of the upper ievels, as shown in the illustration. For the use of guests who are less

> energetically disposed, two elevators are also provided. The flat roof of the base of the structure two stories above the subw-covered landcase, serves as a promenade and provides room for many outdoor games

that are the rooms

# MACHINE PUTS NATION'S GREAT SEAL ON PAPERS

Prestoential proclamations and other state documents of high importance are made effective by affixing the Great Scal of the United States which in reality constitutes the nation's signature. Last the half-tim levice that carries out this a tle-known and interesting formality has seen increasing service. To offix the scal, a paper wafer is first posted on the document, beside the agnatures of the Predent and the Secretary of State. The paper is then slipped between two matched dies on the machine. Twitting a weighted handle forces the three-mich dies together, impressing the design of the seal.

# KILL TREE PESTS FROM HIGH PLATFORM

Waging war on insect pests, from an overhead point of vantage, is made possible for orchard owners by an insecticide rock of hoghsh invention. Drawn by a rock of agrees two tanks of the liquid posson and supports an elevated platform

where the sprayers work. Two men in the crows nest of the apparatus apply the insecticide to the tops and the sides of the frust trees with the aid of their spray maxies, thus reaching parts of the foliage maccessible from the ground



From the vantage point of the high platform, which rests on a tractor-drawn truck, workerto are able to agray the tops of trees with insecticide in their effort to hill the pests

Counterba ancing weights enable this plane to fly with a passenger at twenty in as an bour around the post to which it is fastened

Att be sensations of fiting and produces by an amusement device perfected Ly an eventor of Schulenberg, Tex. The three see ker seats himself in a minarure plane the weight of which is then reduced nevely to sero by an electrically operated conserbalance. When the plane's electric motor is started, it taxies around a supporroug pose and takes off realistically diving or zooming at any height from one to twenty-ave feet from the ground in response to a touch of the paint's controls When the power is throttled down or cut off, the plane glides to a graceful landing An anchor is provided to hold the plane on the around when empty



## LIQUID FILTERS YIELD LIGHT OF PURE COLOR

Mixivo benzol and carbon bisulphide and aiding tiny particles of broken glass, Smithsoman Institution actentists have obtained light of pure colors. Its effect on plant growth is being studied. When the vessel holding the mixture is placed before a lamp, hight of any color is transmitted by varying the temperature or the proportions of the liquids until they, and he glass particles, have the same refractive power for the desired color. Light of unwarded cours is scattered by tefraction. This method is declared superior to the use of colored acreens.





Above, amusement plans the age of ground. Its possition is desermined by the counts became the weight some at opporing his when the phone. At all when the phone is in the phone is not ght only the play only a but are vistable at a the group ground that the group ground that are vistable at a the group ground that the group ground that are vistable at a the group ground that the group ground the group ground that the group gr

# WORDS ON SCREEN HELP RADIO ACTORS

RADIO draman are now being made more bickke by projecting the players' lines upon a large acreen in the broadcasting studio during the performance. Reading their parts from the enlarged acript, the actors are able to play them more realistically than they could if individual manu-

acripts were used. In addition to this the state manager can give directions and augrestions to the performent, while the broadcast is going on, by writing his ideas in marginal notations. The photograph shows a try-out of the innovation at Frankfort-on-the-Main, Germany



# SYEAL OF ADMOST PLATE

Belgw. bol'etproof car Its three layer adea stop bullets and book them as de shown to the put are at left.

### ARMORED CAR STOPS AND HOLDS BULLETS

PROVIDED with builet-catching walls, on armored car or new type protects by-standers from the basard of ricocheting bubets in the event that it is freed upon. Its three-layer wal, has an exterior shell of a unmanum, a sandwich like filling of insulating material, and an inner barrier is a celearmor pia e that is important to projectiles. When a builet penetrates the outer shell, it rebounds from the armor and is trapped in the insulating material.

# USE ALUMINUM ON TELESCOPE MIRRORS

SILVERING the mirrots of astronomical telescopes may become a thing of the past as the result of successful experiments in giving these minrers a coat of aluminum instead of salver The aluminum face. virti. la nor tarnishing, has the additional advantage of reflecting ultra-violet zave with great facility 1 is applied by heating aluminum to vapor to n vacuum, the condensing vapor forming the metallic coating. In the accompanying photograph the new process is shown being used to coat the thirty-sixatch werror of the Lick Observatory in California, the largest mirror thus treated O cale. The marrie itself is seen in the foreground, mounted on a track for convenient handling. while behind it is the Vacuum Chamberwell the aid of which the aluminum finish is de posited on the glas-



Applying aluminum cost to Lick Observatory's mirror. The apparette used to the process (e.ig. the background

#### NEW ANTI-AIRCRAFT TRUCK

To aware ground troops against close-range straing by chemy attack, tried out successfully at Fort Bliss, Texas, may be rushed to any part of the defense line at a moment's notice. In three machine guns are mounted so that they can be swung in unison to any engle, filling the sir with a barrage in which no low-flying aircraft could survive. Oversize balloon tires enable the truck to make fast time over rough country while its short wheelbase permits it to turn and manegyer with unusual case.



# IN SIX-FOOT SPACE

CAPABLE of twisting with case around trees and turning in cramped quarters, a baby tractor, perfected by an Italian agricultural scientist, is called the imatiest in the world. Its pivoted tractor tread enables the machine to turn completely around within a yard and a half of space, as idustrated above. A quart of gasoline is declared sufficient to drive those-cylinder, five horsepower motor during two hours' work

# Microscope Adventures

be able to soive While on a trip through a world of microscopic wonners, the ish bowl, a group of amateur microscopists came upon Pete, Pete is, or was, a baby tropical tish, a red moon about three-lighths of an inch long. He had a name because he was the solitary survivir of a school of young moons. In fact, it was fete who attracted attent on to the fish howl in the first place. An argument trope about his abuity to consume pieces of food larger than bimself

I wonder if he has teeth," one of the

trio remarked

Surely not in a fish that small a sother declared

I I bet he has," said a third

It'll be easy enough to find out " the first said. "Just put Pete under a micro

I is was not as easy as it sounded. Pete being of considerable size as microscope specimens go, and very lively be sizes obviously would not pose on goess who while his mouth was examine at its size of precautions were taken

These precautions, as finally worked in a the three eager restroacopies, consistent a cut of a hard entered to the same a make in a same a control of the same teen bench section from a code of a large was comented to the glass slide with samilar. When this had dried. Pere was put into the depression formed by the ring, three or four drops of water added and a cover glass dropped into place. The glass pressed gently on Peters back fust enough to keep him from wandering about the small enclosure.

It required less than a minute to prove to the three observers that Pete had sharp, tiny teeth in an even row along the jay. This indicated that the tiny MORTON C. WALLING Tells How You Can Have Many Exciting Hours Watching the Tiny Creatures in Your Aquarium and How You Can Take Good Photos of Them

tish, by working at a piece of food almost as lag as himself could nibble off enough for a substantial meal

Let's see what else we can find our about him, one of the explorers suggested

So Pete's privacy was invaded again A small area on his side provided enough entertainment for a half hour. At low in the location has seen a to orderly array were removed to the factly which was to be the factly which are some the time ranges of he is dividual scales could be seen.

But the most beautiful picture was provided by the pigmented cells. Pere to the naked ever looked residish with black markings. Under the microscope has true beauty was beought out. I can olors were found. That is, there was

Cour kiness of me sen or rells or chromatophores is the anotherst calls shere. Most promunent were the black ones that femilies affects spranger to Inca tok Then there were forty large recongmoney , pla mand with smaller prange and visilow pages. Such hed on color spots are found in meny fishes which, to the anamero eve appear drab Chromatophores of different colors sumbine to form other hoes. Thus yellow mixed with black

At right, the head of a water field at them under a microscope fit is runed for fish food. Lower left, baby fish incide a hard composition ring over which is a cover given. In this way the bab is held and studied

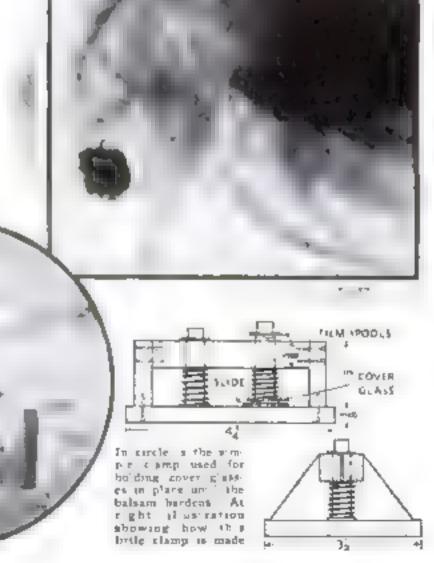
produces a brown that greatly improves the fish a color scheme

I can't get all these color patches in focus at once," one of the observers, complanted. He was using 100 displacers magnification.

That must be because some of the cells are deeper than the others mother sate.

Yes," the third adead. "The black mes seem to be nearer the outside

Peters heart provided a fascinating exhibition. Through the lens it could be seen, heating with apparent vigor, a though Peter himself was not moving. The red blood could be seen rushing our of the throobing sack as it contracted and rushing in when it expended



in a Fish Bowl The manner of cothecting plants and anima a from an aquarrum and placing them on n glass s' de h shown as the right Below, a low of the tiny prestures that will be found in a fish bows They are strached to mictoscobic plants by means of the pog threads which are muscular in suture Illustration shows how n floud built is used in a draw no rabinos putrostone to make mong If you have a a ngle condenser less. you will find the flood tamp g ves abough light to get good photos all of the air that was trapped in those few drops of water "But his beart still beats," the observer and.

> Lots of animals are to all appearances dead long before their

heart stops beating," another explained "Or you can say that the heart beats long ar the animal is dead, whichever you prefer. A frog is a good example. And

Lank the explorer at the microscope exclaimed. This fish has bee-Lace

"Well maybe not lice. But he seems covered with tiny round things that look for all the world like balloon tires They re scattered about over has body Here are two on his eye."

What magnification are you using?" Two hundred and fifteen diameters." "Do they move:

"Yes. It looks to me as if they have rows of tusy, vibrating legs around their moer and outer circumferences

"Let me see "both of the others chuned For an bour the true of fish-bowl explorers studied the creatures

Look like diatoms to me one of hem declared

"But did omy don't have legs to wave." another objected. "They re plants, you

Here's one swimming around in the waler the trust at the microscope cried 'And how it can travel. Looks some thing the a cougheat tire with a domeshaped had someone on traveing side-

None of the books on hand would throw hight upon the mystery, so the eyeweary explorers finally called it a day, tossed the erstwhile l'ete urto a but le of alcohol and went their respective ways. next evening. But when the next night rolled around they found so many other fascinating things in the aquanum that they neglected to resurrect Pere for furtber study

So the wheel-like inhabitants of Pete's body remain a mystery. What are they? Perhaps you can answer the question, You cannot study Pete for he was thrown into the garbage can long ago. But you can buy a few cents' worth of baby fishes and explore them microscopically to your heart's content. They will be so fascinating that you probably will spend every evening for a week at it, even if you don't find any "lice."

The aquarum or common fish bowl. particularly if it is of the planted, balanced variety that has been in operation for several months, is truly a world of wonders. You (Continued on page 97)

Pigmented scales, found on tropical fish, when highly magn had appear as above

"Say, I believe Petes dead," one of the three remarked suddenly. "He hash t

moved for a long time " The observer at the microscope switched to a lower power, one that would include the whole fish in the field of view

"I think you're right," be said, after several seconds of peering. "He doesn't seem to be using his gills

"You can't blome him," one of the others declared. "He's probably used up

# LIGHT FOR MOTORISTS BURNS LIKE A FLARE

SERVING as a signal light for campers and a trouble light for motorists when a tire has to be changed at night, a compact chemical candle has just been introduced. When its top is removed and stratched across a striking nitface on the box, the candle ignites easily. Wind or rain cannot extinguish the light, which burns for thirty minutes and resembles that of a radroad flare. Thus it not only lights the work but serves as a warning signal to other motorists. One or two of the candles, dropped in a tool box or camping ks. require little space and are instantly available, when needed



#### USE ELECTRICITY INSTEAD OF FOOD

CAN a light both take the piace of a minare meal? Risking the censure of gourmets, a B it ish authority, Prof. A. M. Low. boidly proposes that the energy consumed by the human body through an average doy's activity may be replaced, at least in part, by electrical radiation in stead of food. The Lustration at the right shows him demonstrating how a future individual may dine on rays from an electric lamp instead of from dishes of choice viands, a prospect that may appeal less to lovers of good eating than to scientific minds. Nevertheless, Prof Low maintains, the electrical form of refreshment has physiological advantages, "recharging the body with available energy





# NEW METER GAGES LIGHT IN ROOM

Service men of public unitry concerns are now using a recently invented light meter to demonstrate to consumers what their actual lighting requirements are in each room of their homes. The instrument comprises a light-sensitive disk that generates its own electric current when illuminated, and a meter that registers the intensity of the light. By holding the meter above a bridge table, an shown above, for example, the electric firm's representative can show the players whether they are using sufficient light to save the players from danger of eye strain.

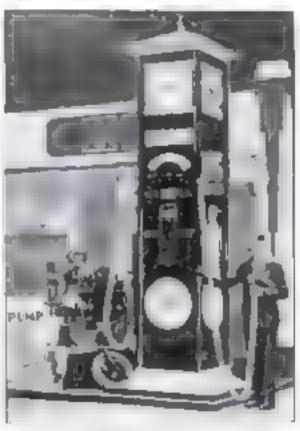


# CAMERA SMALL ENOUGH TO HIDE IN THE HAND

So small it may be hidden in the hand, a miniature camera shown at left, is said to take sharp, clear pictures one and one eighth by one and one half inches in size. Focusing is made unnecessary by the short focus of the lens, which permits portraits and close-ups to be made without the usual portrait attachment. The shutter is set to make snapshots alone, since these constitute the majority of pictures made by the amateur photographer. Becouse of its supplicity, the camerais unusually inexpensive. The photograph shows the midget size of the instrument and the roll of finegrained film it uses.

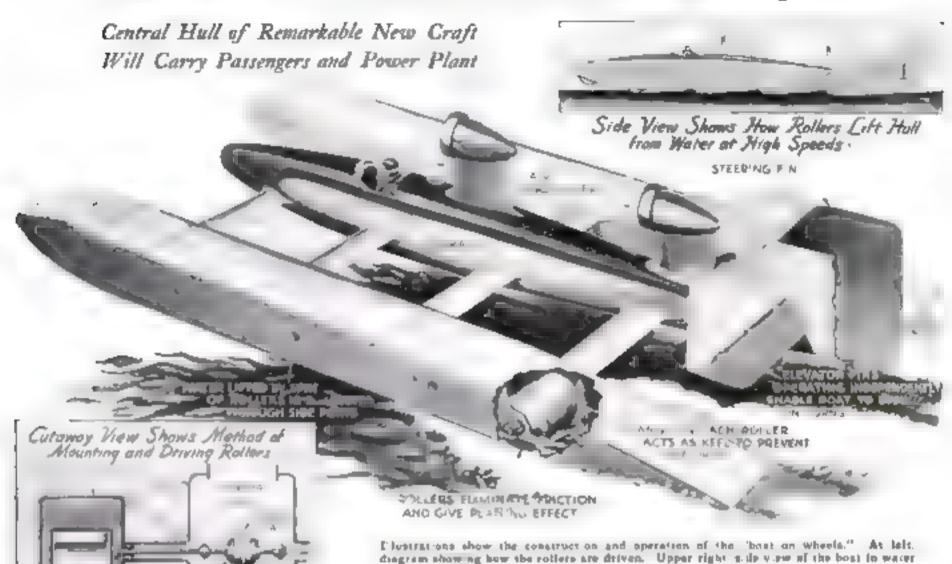
#### FULL MOTOR SERVICE FURNISHED BY PUMP

Containing a whole service riction in a single fuel pump is the achievement of a British inventor, who recently exhibited his device at a motor show in London. It supplies fifteen brands of gasoline, fourteen brands of motor oil, Diesel fuel oil compressed air for tires, plain water for radiators, and distilled water for butteries. In addition it provides vacuum cleaning service for the upholistery of the customer's car tells him the correct time, and calculates the amount he owes.



Pump that provides full service for care

# Boat on Wheels Aims at High Speed

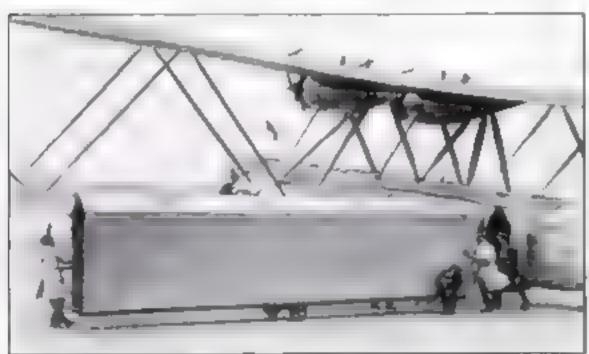


Placing a boat on wheels to make it ride over the water more swiftly is the proposal of a British inventor, who has designed, and patented in this country, a craft embodying the odd principle. Its prior and passengers sit within a central hull that carries the power plant and the twin propellers that drive the boat. This hull rests upon two outer hulls, placed side by side in cotamaran fashion. Each of the buoyant ower hulls is provided with a set of cylindrical rollers which are peared to the power plant and are partially enclosed in recesses in the hult. At low speed the craft depends for its buoyancy upon that of the outer hulls, which ride low in the water. As

the craft game velocity, however, the speeding rollers tend to climb out of the water, and lift the hulls and the whole boat with them. In consequence, friction between the water and the hulls is triminated and a high velocity is attained. To enable the boat to be maneuvered at the speed its inventor expects it to attain, he provides at the stern, a rudder fin resembling that of an airpians. Elevator fins bank the boat when making a turn,

# CANVAS GANGWAY SHIELDS AIR TRAVELERS

So THAT air passengers may board a plane in comfort while the motors are being warmed up, and disembark without the sensation of stepping into a burncase, a canvax hood that serves as a shield from the peopeller blast has been placed in service at Croydon, England Mounted on two wheels, the portable tuncel is trundled up to the door of an arriving or departing air liner as shown in the photograph, and is used like a gaugplank by the passengers.



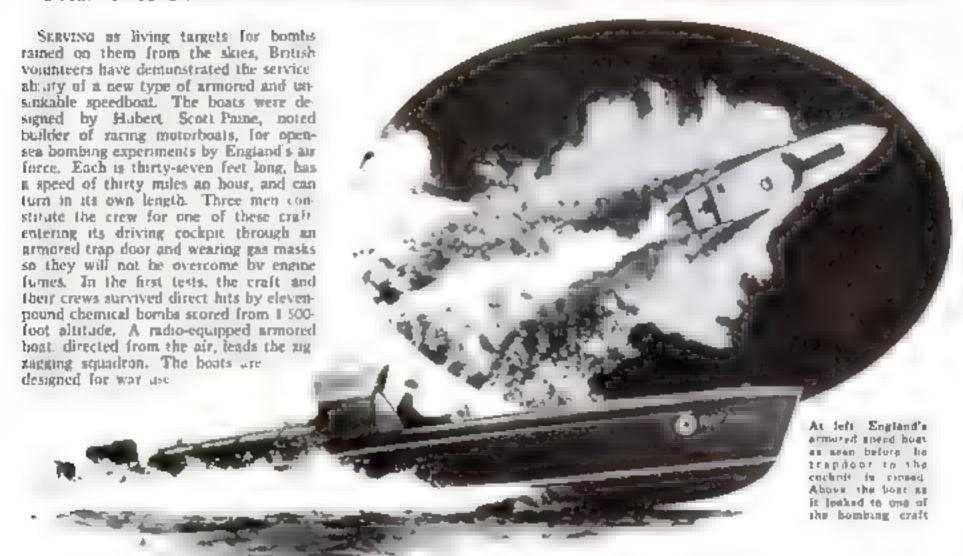
Canvan gaugeray that ah a de air travelers from the blast of the plane's propeller



# ONE-WHEELED COASTER ROLLS LIKE A HOOP

A now who likes to roll a hoop may roll along with it, since a Vienna, Austria, engineer has invented a one whiell coaster. The youthful passenger sits astride a seat within the odd vehicle. This seat, supported by a roller, is stationary, the rim revolving around it.

# SAILORS MAN NEW ARMORED BOATS AS PLANES BOMB THEM





Ship left becauced on a rock by a receding high tide

# ABRASIVE COMPOUND IN NEW CIGARETTE LIGHTER

By using the electrical resistance of an abrasive compound to make it grow when current is passed through it a manufacturing firm of New York has produced a new kind of electric cigarette lighter. When the plug is connected to any house hold outlet, the user simply presses a button to obtain a light. The simple heating element has no parts to get out of order, and is said to cool off almost instantly after use.



#### HIGH TIDE PUTS SHIP ON TOP OF ROCK

Witten an unusually high tide meanier at the treaty port of Amoy, China a tow weeks ago, theft in its wake one of the world's strangest shipwreeks During the night of he high ale the cew of a small Ubsnese junk had anchered il unwittingly above a large rock holden by the waters. The receding tide left the boat perched high and dry upon the rock as perfectly balanced as if it were purposely set there The unusual photograph shows the hapiess crew styl aboard their marooned craft, was ing for another abnormally high tide to cover the rock and again doat the ship.



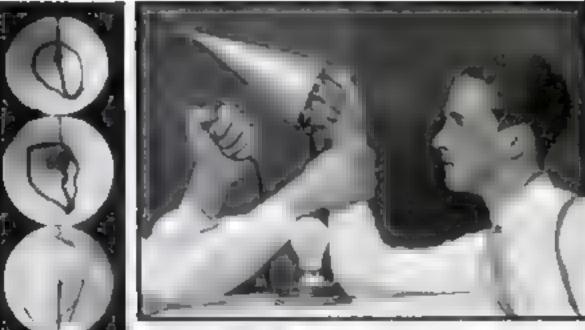
# GLOW CAUSED BY LAMP IDENTIFIES MINERALS

RECENTLY demonstrated in New York as a modern and to the prospector and mining engineer, an ultra-violet lamp has been desarred especially for the testing of samples of minerals. Under its rays the specimens glow or fluoresce, in the dark, each with a bri hant and characteristic cotor. Thus by noting whether a certain minera, bas a alue or a green glow an observer may quickly differentrate between two ores of similar appearance that could otherwise be distinguished enly by a long-drawn-out chemical analysia. According to the maker, the apparatus is also adaptable for educational use and may be employed to demonstrate fluorescence in the classroom.

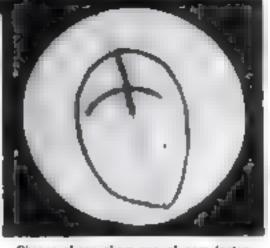
# Instrument Exposes Fake Cripples

Known as a "perigraph," a new instrument, declared to be the first of its kind, charts scientifically the ability of a person to flex his head or limbs in any direction. Thus it enables a surgeon to follow the recovery of a patient from an injury handicapping the use of one of his members; or, in a law court, it is said to anmask a faker with a pretended injusy The cone-shaped device is grasped in the patient's hand, if his wrist is to be examined, and held in a vertical position by a small pendusura in a ring at the cone s tip. Then the patient turns his wrist in every possible posttion, as far as it will go. Meanwhite a small lamp inside the cone, so bung that it always casts a narrow pencil of light vertically, traces a line around a conscal chart of photographic paper lining the shell. When

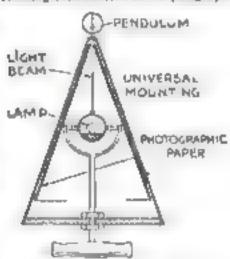
developed, the chart shows precasely the limits of movement Attachments adapt the instrument to lest the head, knee or faut. No one faking a crippies Lorio could escape detection, the makers declare, since it would be impossible for him to make two successive records that would to y exactly in every detail and thus his faking would be instantly exposed.

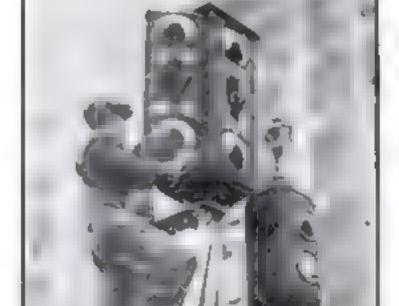


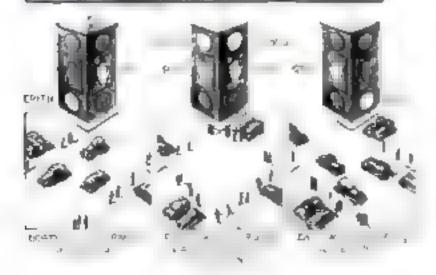
Left perigraph's record of normal head-movements Bolow, diagram showing construction of the perigraph



Photos shove show use of new frattament that requires movements of head or limbs and exposes falls crippics







# TRAFFIC LIGHTS STOP ALL CARS FOR PEDESTRIANS

Now under trial in New York City a new traffic-control system gives the pedestrian a longawaited opportunity to cross the street in safety. The traffic signal used has a glowing red hand that takes the place of the conventional red lens, and for twentry seconds during each cycle of traffic the red hands shore in both directions. During this pertod all cars must stop even left and right hand to us being probilated and orange oghts gowing above the red bands, inform

the pedestrians that they may cross unbindered. The lower lens of the signal is the conventional area with for auto traffic. Diagrams at left show the three principal indications given by the signal, which with three bitel intertoediate changes, complete the entire cycle.

Upper left initialling one of the lights that stops all care and gives pedestrians right of way. At left three views of the signals as now installed



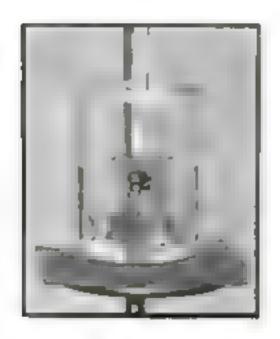
# DINOSAUR BONES PUT TOGETHER UNDER LENS

Howes of a pygmy dinosaur, so de icate that they must be handed beneath a microscope lens, are being assembled by Barnum Brown of the American Museum of Natural History to give paleontologists their first glimpse of what this newly discovered, carnivorous species looked the The locky find was made in Montana iast October, when a natural cache of those than 100 bones was discovered.

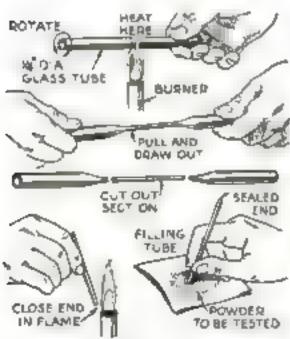
# Home Laboratory Tests of



# Household Chemicals



Heating a substance in a beater as above, and using a thermometer to get the temperature of which it make often will give the home chemist a clue that will enable him to identify it with accuracy



This Hightration shows how a container is made from a glass tube so it can be attached to thermometer as is shown in upper photo

Are they safe? Are they worth the price you pay for them? Simple tests in your own laboratory will reveal the answers.

Perhaps you are skeptical of some new brand of gasoline. You may wonder whether it contains impurities that will corrode the velvet-smooth surfaces inside your motor. To answer this, you need only perform the standard gasoline corrosive test developed by expert industrial conneces and chemists to control the quality of their products.

Simply place a brightly polished strip of sheet copper in a large test tube and pour in enough of the gasoline to cover the metal. Then place the test tube in a hot-water bath, heated to 122 degrees Fahrenbeit, for three bours. At the end of that time, inspect the surface of the strip. If it has become disculored, the gasoline has failed to pass the test. Government specifications require that the copper must be free from discoloration if the gasoline is to be classed as "non-corrosive."

SINCE it will serve for many other experiments as well as your gasoline tests, it will pay you to make a water bath similar to the one shown. Consisting mainly of a large can (a slip-on top coffee can will do) a small can without a top, some metal tubes, and several lengths of rubber tubing, it is a simple piece of apparatus to make. Of course the various joints between the tubes and cans must be tightly soldered so as to be water-tight.

In use, water is allowed to flow into the bath through the U-shaped inlet tube hooked over the rim of the small can, From these, it flows into the larger can which serves as the beating chamber. When the water level in both cans reaches the mouth of the adjustable outlet tube projecting up through the bottom of the smaller can, any excess flows oil through the exit tube to the drain. In this way

the water automatically is main asned as a constant level

A two-tach hale cut in the slip-on tap of the coffee can receives the specimen tubes to be heated and a chemical type thermometer for measuring the temperature. The larger can is supported on a ring stand and is heated with a gaz burner. By varying the flow of water and the gas flame, you can keep your water bath at a constant temperature. This simple piece of apparatus also is valuable for drying chemicals or evaporating solutions.

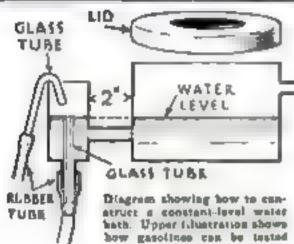
In the field of counciles, the amateur chemist can do a great deal of valuable experimenting. Naturally place a and safety are important in term in any sort of lotton, powder, or cream that is applied to the skin,

Although most cosmetics are entirely harmless, creams sold for the removal of wrinkles and freckles somet mes contain a compound of mercury which after contunued use, is absorbed by the skip. To test a cream for mercury, heat a small quantity of it with strong miric and. This will convert any mercury present into its soluble form. Then heat the mass to get rid of any excess acid, dilute it slightly with water and immerse a simple of cupper in the sour our that results. If any mercury is present, it will amaigamate with the copper (P. S. M., Jan. 'J4. p. 50) and be plainly visible. A face cream containing mercury is usually branced not recommended" by the analytical chemist

when it is hidden in some complex substance. For example, it is a simple must ter to prove that silver it contained in the emulsion of a photographic negative. Simply place the film in warm water for several hours to soften it and then scrape off a small quantity of the coating.

By heating this softened emulsion with name acid you then change any silver present into silver nitrate. Commue to heat it gently to drive off the excess acid and then filter it. Finally add a drop or





two of hydrochioric acid or salt water to the filtered solution. This will form a white precipitate of silver chloride which can be identified by the fact that it will turn bound-gray when it is placed in a bright light. This same process can be used to detect the presence of silver in almost any substance.

To test stypic pencils and perspiration-adaying liquids for aluminum, sumply and ammonium by droside to the actual solution or to the water solution if it is a solid. This will precipitate out aluminum hydroxide if aluminum is present. Wash the precipitate by decanta-I in and filter it off

THEN, to prove the presence of alumnum, place some of the jellylike substance on a small charcoal block and heat it with the intense blue flame from a blowpipe. This will change it into alumnas or alumnum oxide which, when mostened with a drup of cobalt intrate and again bested, will take on a characteristic blue color indicating that the original substance contained alumnum. Metal foils anspected of being made of alumnum or having alumnum in them can be tested in this way by dissolving them in

What Are the Contents of the Everyday Things You Constantly Hundle? Simple Experiments Described in This Article Will Help You to Answer That Question

# By RAYMOND B. WAILES

nitric acid and treating them with the ammonium hydroxide (ammoniawater) as before.

There is, however, a recognized procedure that must be followed in making this flame test. Adjust your gas burner to deliver a yellow flame (no primary air) about an inch or an inch and one half long. A blast of air is then blown through the tlame with an ordinary mouth blowpape. This will convert the almost passive yellow flame into an intensety but and pointed blue flame. The spour from an old oil cas, fitted with a short length of glass tubing, can be used as a blowpape.

MANY mouth washer, eye baths, and hair-washing preparations contain the element boron. Its presence in these sulutions is beneficial. To test a solution for borus, simply this a small amount of the substance with some bydrochloric acid, add some rubbing or similar alcohol. and ignite the maxture. Enough alcohol should be aikled to make the mixture flammable, If a greenish-blue flame is present at the moment of sgrutson, you can be fairly sure that the original substance contained buron. You can repeat the test by extanguishing the dame and religioung it Remember that the greenish-blue color must be present at the moment that the mixture bursts into flame

To test chemicals for their identity, the amateur chemist can make good use of the simple flame test that we used several months ago (P. S. M., Mar. '33, p. 56). Recently, the writer used the flame test to determine the composition of a simple household cleaner

The substance was used to wash wood-work and windows, to clean point brushes, and as it general cleaning agent shound the house. A bit held on a wire in a gas-flame gave an intense yellow flame. This immediately indicated the possibility that the material was, or was composed of some compound of sodium.

To determine more about the substance, a "lass tube was held in the flame, softened, and then pulled apart until a tube of needletike diameter was formed. This was broken off and one end scaled over to make it airtight

A small amount of the cleaner then was ground to a powder with a motter and pestie and packed into the tube. When the tube was filled it was fastened to the bulb of a chemical thermometer and unmersed with the bulb in a water bath that was heated slowly Being close together, both the

thermometer and the powdered cleaner were maintained at the same temperature.

Watching the thermometer and the powder closely, the exact temperature at which the substance mested was noted. It was seventy-seven degrees Centigrade Chemical tables revealed that tra-sodium phosphate had that melting point.

THAT the substance was a phosphate finally was proved by making a solution of it by whing runic acid and some authorism multiple is solution. Gentle beating developed a yellow precipitate, indicating the phosphate radical.

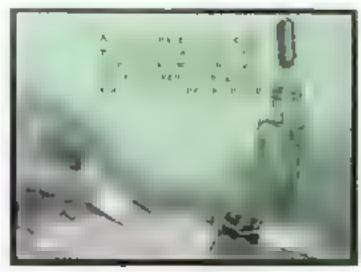
The flame and melting point tests can be used to determine the identity of many other substances. However for materials whose melting points are higher than 100 degrees Centigrade, strong purpharic acla, salt water, or paraftin oil is used as a bath

It is a simple matter to test for the presence of a surplude in a depilatory cream. In the first place, your nose will tell you almost instantly that bydragen-sulphide gas is present. As a positive test, hold a white strip of paper, most-ened with lead-acetate solution, near the cream. If hydrogen sulphide is present, the paper will turn brown or black.

From is a rather simple substance to detect. You can identify it in any tonic, either pals or liquid, by dissolving the substance in hot water to which some natic acid has been added. After the solution has been filtered, add one or two drops of sodium or ammonium sulphocyanate to the filtrate (resulting solution) If iron is present, a red color will form.

By adding an acid to a substance such as cleansing powder chalk or whi ing you can test for a carbonate. If it bubbles or efferweaces a carbonate is present

A simple test for detecting the presence of aspirm in everyday substances is to dissolve a bit of the material in anmonium hydroxide. Then add two or three drops of copper-sulphate solut on and mix in some hydrogen peroxide. If a redeishorange color forms on warming, aspirin is present. (Continued on page 198)

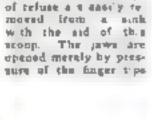




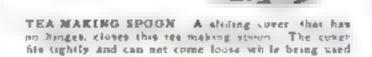
CONTROLS HEAT OF WATER The fauter control, shown above automaten y missa hat and co d water to g ve desired temperature. The pointer is set to required here and the volume is then controlled by handle is the ordinary way



BINK SCOOP Straps of refuse a 4 dass'y to



CELLUPHANE FOR CHINA Dugr is kept from china by means of the tal ophane cover shows at the right. The covers also can be qued to keep cakes moust and clean.





WASHBOARD THAT WRINGS OUT The surface of this washboard is reade of rubber and can be removed so the water can be wrang out of at. The board a otended for use in wishing gloves, ingeric. suces, and all else requiring cateful bandling



VERSATILE WIRE HOLDER. The user is amazed as the variety of forms the wire belder will assume. By to dong it you can have a few stand, a bot dish halder an electric right socket or a baking place holder as seen in photos above.

NEW TYPE SOAP HOLDER, Mussy soap dishes are eliminated by the soap holder shows, that clamps read by to any faucet

SUPPORTS PLOWER POT A secure support for a flower-pot in provided by the motal holder seen at left. It all ps between window and soil and in held in place by two small early, easily inserted.

# Why NATURE GROWS

# THINGS IN Spirals



ATLRE likes to grow things. from microscapic shells to stupendeus spiral nebulæ, in the form of a spiral. To draw a sparal, and at the same time soive this mysterious tendency of nature's, follow these simple directions.

Take any pointed shell. An ordinary snai shell will do. Fasten, with a bit of adhenve tape, a piece of string at the start of the operal groove near the large end of the shell. Then wind the tape in the spiral groove right down to the point

At this end of the tape make a loop and insert the point of a pencs). Then, with the shell held point down upon a large sheet of paper, unwind the tape round and round, at the same time draw ing a line with the pencil.

The result on the paper will be the kind of spiral nature uses in shells, many



Braw a line as above, by unwinding tape from the grooves of a son l'e shel. In this way a perfect spread will be formed Brudy of the figure shows that nature were this form because it perm to indefis to growth without change of shope At left horns that fu nish a splend d example of this spiral form of growth

flowers, horos of animals, spirit nebutar and to on-

This shell-drawn spiral has a remarkable property: it expands in such a way that an object, growing along its curvecan become indefinitely larger without changing its shape. As an illustration

To a little triangle "A," shown in the drawing 61 upper right, add the piece "H," and produce a larger triangle of the same shope. The angle in seventy-five degrees in the small triangle and it remains seventy-five degrees in the larger one

Now apply this to a spreal shell. To

ARROWS SHOW FOUR DIRECTIONS OF GROWTH ANGLES AT A B.C.Q. ARE ALL EQUAL

> Dagram above shows how apical of growth can be drawn on cross rection bilbil meganiti the aid of a shell After the framework in drawn, the curve in put around at steelund

At left, spiral pehala

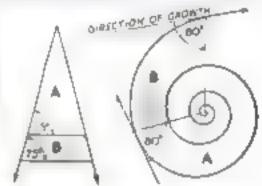


Diagram above ng how a triangle or a union the can be indefinitely and god we hour changing the share. The shaced post una h each drawing were saided but the or ginal shape at in clour comales the same in spite of add. one

the stural shell A the piece B grows in The added part produces a larger shele of the same shape. Like the triangle, it remains the same shape because the ana between the shell's direction of growth and its extending base-line remains the same. This is why the spiral of growth en nature in called the equi-angular or logurathmic spara.

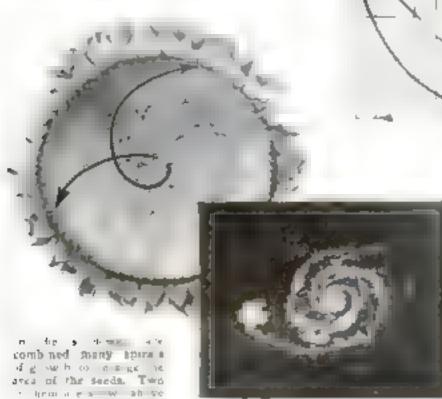
This equi-angular sparal is the only curve that enables a structure to grow larger without changing its shane. This is why the curve is found in so many of nature a creations.

It will be interesting to see how nature applies it in a few instances

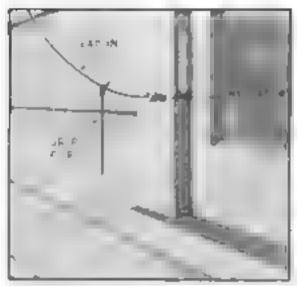
The seed-dock of a sunflower most get arger in all directions at once. It must remain circu ar while it grows. Accordingly, nature uses a great many equiangular spirals of growth.

The spiral neoula, however grows along two arms thrown out from the whirling central mass of gas. Accordingly, only two spirals of growth are found in it

If you wish to draw a spiral of growth without the aid of a shell, you can do it with a piece of quadrille-ruled, or crosssection paper. Start your spiral at any crossing of two lines and make each side of the straight-line framework twice as long as the preceding one. The curve is drawn in free-hand around the framework. At each of the points A, B, C, and D in the drawing in the center column. you will find that the direction of growth makes the same angle with a line to the sparal si center.

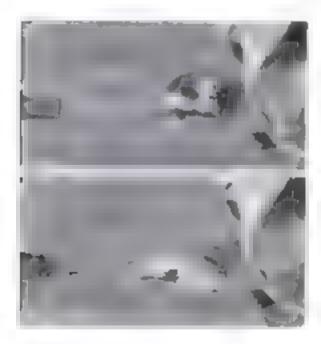


# Keeping Your Radio in Order



# Keeping Lead-in Wire from Bringing in Rain

FTER having little success with the asual methods of preventing rain water from running down my antenna lead-in wire in such quantities that it would flow through the insulator onto the sai of the window, I hit upon the simple kink shown in the photograph above First, I arranged the wire so that it would approach the window in a gentle are. Then, I tied six inches of stout cord to the lead in wire about three feet from the window, making the knot in such a way that one end hung down about three or four inches. Now, any water that flows along the wire, catches on the string and drops harmlessly to the ground. Incidentally, this kink will work just as well in cases where heavy rain causes water to tray down the wire and through the flat lear ar strip that is sometimes used —F. C.



# Soldered Connections in Short-IV ave Receivers

IF YOU have constructed a short wave receiver and fad to get results, your connecting wire and soldered joints, rather than the hook-up itself, may be at fault. Short-wave circuits are far more critical than those designed for the longer waves and too much resistance in the wrong place may upset the balance. If the circuit checks with the diagram, trace

through the wiring and be on the lookout for unnecessarily long connecting wates and poorly soldered joints. Shortwave circuits that have given little or no

response when first connected have been known to operate perfectly when long connections were shortened up and suspictous looking soldered joints were opened cleaned, and resoldered. This precaution also holds true in troublesome short-wave converter units.-L. T. H.

# Emergency Repair for Noisy Volume Control

WHEN a wire-wound volume control gets noisy with age, it is possible sometimes to make an emergency repair with some alcohol, a soft rag, and a pair of phers. Remove the main body of the resistance from the calanet and rub the wires with a cloth dipped in alcohol. This will remove any dirt or grime that may be covering the contact surface of the wires. Then if the wires look worn where the rotating arm rules, bend the arm slightly with the phers to change the point of contact. Before replacing the unit, check up on the nut that holds the contact arm in place. Of course, if the wares of the winding are loose, this may he causing the noise and it will be best to replace the entire unit or at least the winding -1 &

# Removing Tubes From Miniature Cabinets

BECAUSE of the many ports that must be crowded into miniature cabinets, it is difficult sometimes to remove the tubes from a modern compact of semicompact receiver. This is especially so in

cases where the tubes have been cemented or glued in place by the manufacturer. Turging at the glass globe of the tube may result in the builb and base parting company. To avoid this risk, the writer uses a cheap pair of ice tongs with sponge rubber pods taped to the pronats (potate lifters will serve as well) When a tube is to be removed from a crowded set, the improvised tongs can be lowered over the bulb and clamped securely over the base. A steady trut will pull the tube free and all the pressure will be applied at the strongest part of the tube.—K. D P



Small age congs the prongs of which are covered with aponge rubber, in handy to comove tubes



# To Prevent Buckling When Bending Copper Tubing

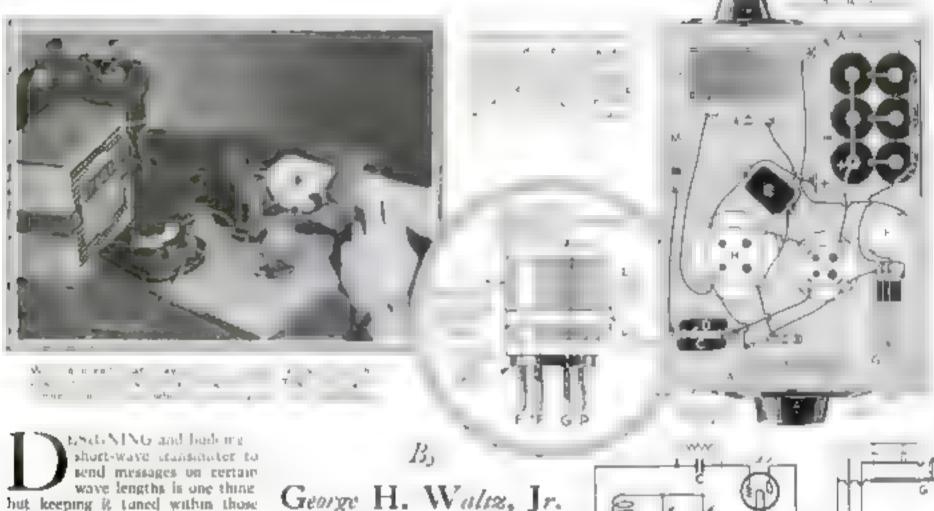
WHEN bending thin-walled copper tubing for transmitter inductances you may find it difficult to keep the metal from buckling. If reducing the pressure and bending lension on the tubing does not belp mattern, try filling the tube with sand. If sand is not close at hand, anneal a short length of copper wire that is a loose fit made the tubing. Push this into the tube and pull it out bit by bit as the bending progresses, making sure to pulthe wire free of each bend - I S

# How You Can Measure Resistance of Any Unit

BY CONNECTING a known resistance. a 0-1 milliammeter, and a B-battery in sense with two binding posts, you can

measure the reas ance of any unit Simply connect the unknown resistance across the terminals and note the reading. Then by comparing this with the reading when the binding posts are shorted, you can figure the approximate value of the unknown una-For example, if a fortyfive volt battery and a known resistance of 45,000 obms are used, the meter will read one miliampere when the binding posts are connected together. Then if an unknown unit, connected to the terminals. swings the needle to half of a maliampere, it or dicates that the unknown resistance in equal to the known unit (the current is cut in half when the resis-(ance is doubted) .- R. S. E.,

# This Simple Monitor Checks Your Transmitter



wave lengths is one thing. but keeping it taned within those bands in another

Until you can beast of some means for adjusting your transmitter to known frequencies accurately your amateur station will not be compiete. Operating a transmitter without tuning it is like firing a ritle without siming it—the results are just as hapbasard and dangerous. If you allow your set to send out waves autside the regular bands the Government may revoke your license. confiscate your equipment, or impose a beavy fine

Many amateurs rely on homemade or factory-huilt wave meters to check their sets and hold them within the specified banda (P. S. M., Sept. '32, p. 54) Generally, these meters consist of a coil of wire and a variable condenser coupled with some device a flashingh, builb or a brightenter that will negate time by when the transmitter's frequency is ad-

As a check on the frequency the wavemeter does a good job, but accurate tuning is only one of the requirements of a good sending station. To the amateurs who listen to your signal, clearness, steadiness, and lack of interference will be of equal importance. To gain the approval of both the government and your brother amateurs, you must use some arrange ment that will check the quality as well as the wave length of your signal. Such an arrangement is called a monitor

A monitor is merely a simple shielded osculator housed in an aluminum cabinet In reality, it is in most cases a fixedfrequency receiver having a variable condenser used, not as a tuner but as a means to indicate the singhtest departure of the monitored transmitter from the desired frequency

If a monstor is to hold the ca ibration that will make it serve as a check on the transmitter it must be constructed randly. To

be really effective, its calibration must be more reliable than that of either the receiver or the transmitter. The condenser must be sturdy. The coils must be rigid. And the entire circuit must be designed and constructed with a thought given to Stability

Being simple, the monitor for your station need not be expensive. If you have a 100 tube in your junk box, the monnor shown in the drawings can be constructed almost entirely from spare

Although specific ratings are given for the condensers, small variations one way of the other will make no great difference. In fact, the specifications given bere should serve only as a guide. Even the coil windings may have to be aftered slightly to give the proper spread under existing conditions.

As shown in the diagrams, the circuit consists of a tube, a grid leak and condenser, two variable condensers, a filament-control pack, a small fixed con-

Wirting diagram for the mon ter circu t. Spac heations for the parts are given on the opposite page

denser, coil or coils depending on the band or bands to be covered by the transmitter, two sockers, and a radio-frequency

The bat ery supply which is contained in the aluminum-shielding can that forms the monnor's carbinet consists of a twenty-two-and one-half voit B hattery and a small three-volt A-buttery made up by assembling six one-and-one-half volt flashlight cells and connecting them in series-parattel.

The plug-in coils to cover the hand or bands on which the transmitter operates can be wound on the four-prong bases of discarded tubes. To obtain a longer coil surface, the tube base can be lengthened with a cylinder of heavy paper. Butt the top edges of two tube bases together wrap a wide strip of paper around them to form a tight cylinder and apply cement to the edge. Then, when the cement dries, remove one of the tube bases and cement the cylinder to the remaining hase. To stiffen the form, cont it with



With the monitor seen at left, the amateur can check the frequency of his argusts and atso linten to the quality of his outgoing against

PLUE TO

PECE VER



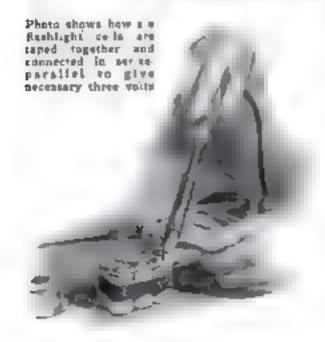
SCRIBED ON A UM NUM MANE. . "10 MARK SCR BED AT "50" E ME O-100" DIAL

An indicating mark in acribed at the filty division of the dal for the constructor A and a mark in also placed on aluminum panel.

the shellar in tacky. This will belo to hold the wire in place and make the consmore rigid.

As shown in the circuit diagram and in the drawing of the coil, the grid coil (larger coil of the two) is supplied with a tap. In most cases this tap should be located just about in the center of the winding. Although it serves to reduce the transmitter's loud signal to a comfortable level, the main purpose of the tap is to increase the frequency stability

In reality, the tap should be placed at the lowest possible turn on the grid coil that will still allow the circuit to operate in most cases this will be about the center turn, but if you desire to get the exact point, rig up your circuit, bread-board fashion, as shown in the photograph Then, by moving the grid corner for glong the turns you can determine at which turn the circuit goes into oscillation. You can do this by listen up with



# LIST OF PARTS for Homemade Monitor

A—Fariable condenser, 20 mmf. R—Fariable condenser, 1-10 mmf. C—Grid Condenser, 20025 mfd. D—Grid leak renstance, 1 meg. E—Fixed condenser, 201 mfd. F—Radio frequency choke, G—Filament-earphone jack. H—Four-prong sacket for tube-base coils.

J—Four-prong socket for 100 tube

K—Clip for connection on grid coils

Li and L2—Grid and tickler coils

wound a) follows:

total coil (L1) Tickler (L2)

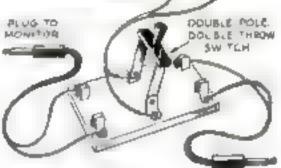
20 mesers 9 4 40 meters 11 7 50 meters 22 9 100 meters 30 15

carphones or by watching the needle of a muliammeter. The whole purpose of the test should be to determine the point of least coupling that will allow the circuit to oscillate

Incidentally, if you have a set of commercial short-wave coils that are not in use, you can make use of them in your monitor. In most cases, because of their rigid construction, they will be better from a calibration standpoint than the homemade variety.

Unlike many monitors, this particular arrangement makes use of two variable condensers connected in parallel. One, mounted at the rear of the aluminum-shielding can, serves as the main unit, and the other mounted on the front panel, acts as a vernier adjustment. Zeto to one hundred dials should be used for both but the vermer dial should be supplied with a long indicating line at the fifty" mark and should be mounted in der an arrow marker and plus and minus signs acribed on the front panel.

Condenser B should be fitted with some sort of locking arrangement that



Exphones wired to contect poets of double-paid, double-throw press, b. furnish a means of connecting bem to the mon-to- o passivet

will allow it to be held in any one posttion. A V shaped since of rubber that can be wedged between the aluminum panel and the condenser dual will serve the purpose.

The first requirement of your monitor is that it oscillate. Then with the pair of earphones you intend using with the monitor plugged into the filament jack, you are ready for the process of finding the approximate centers of the bands you intend working with your transmitter.

the desired band on your short-wave receiver you can tell with fair accuracy ust about what readings of the das ndicale the approximate center of the band. With the receiver set at this noise and a second pair of earphones prugged into your receiver, insert the cold in your monitor and adjust the dial of condenser B to give the loudest ost lation in he receiver phones. During this operation, the dial of condenser A should be set with the long titly marker line centered ditectly under the arrow indicator.

When he escaltation is heard, it will indicate that the monitor is tuned to the same point as the receiver. Lock the condenser B at this point with the rubber wedge or other arrangement and make a same of the reading.

note of the reading

You are then ready to use the monitor in checking the frequency of your transmitter to this same approximate point Let us say, for example, that in adjusting the monitor to your receiver you found that the approximate center of the forty-meter band gave a reading of thirty-three on the large monitoring condenser. With the condenser (Continued on page 113)



ast checked it for him the other day and it was right up

to the mark."

Well, I was about to quit for the day, but I don't suppose we can let a friend spend the night on a lonely road."

Gan decided an he cubbed his hands on a wad of waste. Grab one of those saxgalan cans of or and I'll meet you at

the wrecker "

In less than twenty minutes, the Model Garage tow car, with Gas at the wheel and Joe perched on the seat beside ham pulled up behind a small sedan. Tom-Messier's head was framed in the car window as he greeted the two garagemen.

My crankcase has sprung a leak," he sputtered excitedly. "She's almost dry First thing I knew, my pressure gage started to drop so I supper and took a look at the oil and she's sess than one-

third ful-

While Measier talked, Gus peered under the car and then, walking to the rear followed the general route the car had taken for severa, hundred feet. When he returned, he was shaking his head.

Most of your oil is back there on the road." he announced as he slipped his dashlight into his hip pocket. "Been noticing any puddles under your car when it a been packed?"

"Not particularly," Messler repired. "In fac it was only this morning that I not ced how clean the garage floor was.

"That's funny" mused Gus. "And there's no sign of oil underneath now The stream ends about three feet back That means the leak stopped when you stopped your car "

Do you suppose the drain plug or the crankease boits are loose?" put in Messler

No such bick," replied Gus. "Chances are it's the rear main bearing. But there's no sense guessing. Let's boist her up and tow her an. We'll drop you off at your house and you can slop in at the garage tomorrow and I'll go over it with you."

Gus was a little late getting to the garage the next morning and Toni Messler was there waiting for him

"Well, what's the verdicts the car owner called as the veteran mechanic entered the repair shop.

"There she is." Gus replied, extending a large thumb in the general direction of his bench. Soon as I can get into my

work duds I'll be with you

"You can blame two things for that little oil leak that left you stranded last night," Gus explained as he joined Messier beside the open bood of the car "Bum piston rings and a clogged breather cap on the oil filler pipe. The combination of the two forced the oil through the rear main bearing."

"But what's a breather cap got to do with a bearing? asked Messler

"PLENTY Gas asserted In the first place, your piston rings are just worn enough to be least. Natorally any gasthat blew by collested in the crankcase Under ordinary conditions that wouldn't be so bad out in some way your breather cap got clogged with dirt and goo. That closed up your crankcase Lighter a a corked bottle and the gas couldn't escape Something had to give, so the gas just forced the oil out at the bearing

"If we seen lors of small oil leaks caused by nothing more than a closued breather Even without leaky rines, the up and down motion of the pistons will actually nump up enough pressure to force the cil out if it fails to escape through Que held a piece of metal near the end of the subsum pipe. "See" he said painting to draw a st of water on the mala. and unburned gasound Every car has i"

the breacher he explained to Messler Mora, always see that your treather

cap as clears when you check he of or Juded Messler when this has to shee You know Gus I never thought much about my od unit; ast right when I dien t have any I never added any between oil changes

But that doesn't mean you weren't losing some put in Gas

The or lever stayed preffy much the

same argued Messler

That a possible " trus agreed. With the slew- is the motor has enough gasotine subabiy leaken into the crankense to make up for any you lost, In every explosion of a cylinder there's a certain portion of the gas that doesn't burn compietes. Finally, it a forced by the pistons into the oil. Then, there a the moisture that collects in the cylinders. That ends up in the bil too.

Moisture repeater Messier "Where loes that come from

It's formed when the gas burns," explained Gus. "It's one of the products or combustion. Let's go out in the driveway Joe has his car parker out there and with a little experiment og I think I ,an show you what I mean.

On their way to the car, Gus recruited Joe who was busy working on some bills in the garage office. As Joe started his car Gus, sitting on his haunches, held a stuny piece of scrap metal near the end of the exhaust (Continued on page 115).

BETTER SHOP METHODS: IDEAS AND PROJECTS FOR THE HANDY MAN



MODEL MAKING: HOME WORKSHOP CHEMISTRY: THE SHIPSHAPE HOME



By Edwin M. Love

Except when needed for ill-ameling chemicals, the green sides and door of the furne cubines are folded back to that the native top in left ever and open. The two sides swing back as hinges, the door is stored between them

OR chemical experiments at home the worktable illustrated above will meet your every need. It is convenient, timesaving, and practical—a complete laboratory in itself. The cost of materials is not high, and the construction has been simplified for those who have had little experience in woodworking and cabinetmaking.

As the table was designed especially for readers of Popular Science Monthly, provisions have been made for any desired individual mod ficutions. For example, if you need only the lower section, the upper may be omitted. If the upper shelves are considered more useful, add the back, and, if preferred continue the shelves for the full length. If it is conven-

tent to provide a vent, by all means construct the fume cabinet, where ill-smelling brews may be boiled without tainting the air of the workroom. While the drawing shows the beach with the fume cabinet at the left, the construction can be reversed, so that the table will fit any corner of the room.

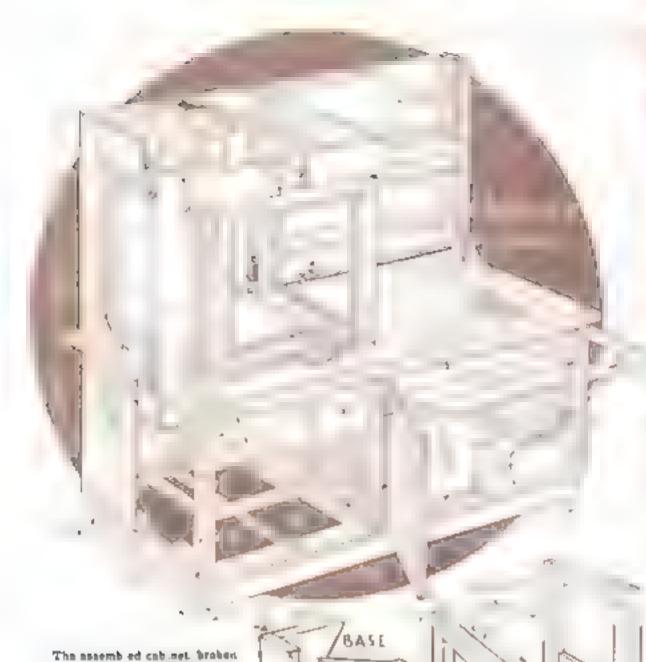
A gas pape with two behs is included. If you happen to own a compressor and power vacuum pump, add pipes and bibs for these in the space below the lower shelf.

The electric-plug outlets are easy to install, but a water faucet can be used only if the necessary connections can be made with the mains. Likewise, a wash tray is almost out of the question, besides being

very expensive. For this reason a rectangular pan held loosely in a frame is shown—a very satisfactory arrangement, since it can be lifted out for emptying A bottle set on the bracket sheaf is a sufficient source of water and useful for instilled water in case city water is piped to be table.

If possible, get vertical-grained stock for the top, and use casein (waterproof) glue. Hard wood, of course is best but pine, fir, or other soft wood is good enough and will last a long time. If straight material placed on all sides is selected, little jointing will have to be done by hand. Put five \$6 in dowels in each joint when gluing up the top.

While the top dries, build the frame;



but before cutting any parts lay out full a sed dimensions on sticks—a long sick for front and back measurements and shorter ones for end layouts, horizontal and vertical. The use of such sticks forestalls mistakes. Locate and score almarks with the point of a knife and label them with pencil 1 so the stock, however, as at happens to come in thickness

and width, rather than taking

away where necessary to show

the construction, and details of the and frames, the sale

back bess, and the drawers

the trouble to conform to the exact figures given in the material list on page 100

DRAWER

Cut all stock roughly to length and width, straighten when necessary, and mark the working faces and edges. With door and frame stiles, leave the rough length until after assembly when the projecting "horns" can be trimmed neatly bash,

Much time is saved if one operation is done on all parts requiring it. For instance, when notching drawer slides, end stars (upright members of the frame) and the like, tip all the tenons with the teeth of the saw splitting the lines and running in the waste then crosscut them all

The frame corners are joined with 1/2 in, carriage bolts 4 in, long. These are tightened by driving a nail set against the nut corners. When a frame is squared up and braced, if necessary, by tacking on a diagonal strip of wood, give and screw the cleats and slides to place. When boring bolt holes to attach the long rails, be careful to avoid striking bolts already in



LEFT END

FROM

INSIDE

Plane the top level across the grain than diagona y and fine y engineers. In each drawer frame a central guide is used at those



Hood with standing stamp. One edge la-

the corners of the assembled end frames. The frame assembled, nail the drawer rails in place and square in all directions. Fit the partition against the cupboard side of the center frame, butting it between the rails. Keep the front edge 11/16 in behind the frame front to act as a door stop.

The corners of the supboard door frames are glaed and screwed. When the plywood sheathing has been glaed and bradded on, set the doors aside where

The drawer sides should have 1/16in, clearance vertically and ½-in, sidewise, When attaching the bottom strips, allow about 1.16-in clearance for the guide, and try the drawer in place before the glue has set. Bevel the edges and ends of the front slightly toward the limitde, so that the joint may appear small, yet have plenty of clearance.

To attach the table top, bore three 5 16-in, holes in the back rall, through which to pass 3-in, lag screws. For holding down the front edge of the top, however, make short slots in the end rats, so that the

screws can slide when the top swells and shrinks. Notch the top for the back at es. drill 3/16-in, holes to receive the acrews, soap the lag acrews, and turn them home. Then smooth the top, joint the front edge cut the ends and round the curners, and give \$5-in, atrips to the back edge at the ends to make up for the thickness of the plywood back.

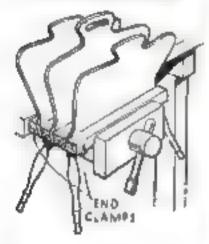
Cover the back, give and brad the end sheets on, and round the front corners slightly.

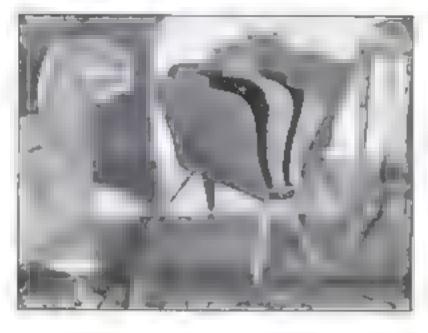
The construction of the back is selfevident The shelves and bood-apron sides are supported with cleats glued and screwed (or nailed). Notice in the perspective assembly drawing how the front apron, to allow outward opening of the door sash, may be notched above it. The cleat is flush with this notch.

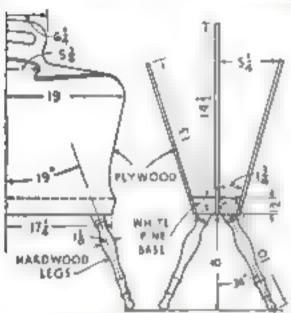
The plywood back extends to the lower ends of the stiles. Install the gas pape and electrical plug outlets before nailing on the back. Use self-contained outlets and screw them on the center stile one on each side flush with the back edge. The pair of wires juming hem are inclosed in a short pace of floam passing through a hole hourd just above he fastures. Connect rubber-covered cord to the outlet under the shelf and pass it through a hole in the back. (Continued on page 100)

# SIMPLY CONSTRUCTED NEWSPAPER RACK

For those who are learning to one ama!" woodworking machines, this rack will give practice to be samest type of terning and sawing



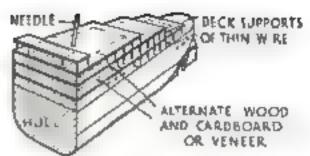




A half side view (with over a l d mans one an and view, and shatch of clamping method

BECAUSE of its unusually simple method of assembly, this newspaper holder can be made by anyone with a home workshop. The drawings show the approximate proportions and dimensions. The legs may be turned from any strong wood; I used a discarded long shovel handle of hickory. The beveled base pieces were made from white pine and the panels from pine plywood. The plywood sides and partition should be cut so that the grain of the two outside plies runs up and down.

Glue is spread on the joints, and the pieces are nailed together with small finishing nails so that they will not slip. In order that the bottom may be clamped in a bench vise, (we end pieces are heyeled with the same bevel as the bottom pieces and used as shown to press organist the joint.—Graalin C, Henneyy.



# HINTS ON CONSTRUCTING MINIATURE LINERS

When making the decks of miniature liners, such as the Manhatton and the Reemest models designed by Donaid W Clark, it is best to build them up of alternate layers of wood and either thin cardboard, wood veneer, or stiff, heavy paper, depending upon the scale of the model. Cut the pieces of wood that represent the decks narrower than usual, but cut the pieces of cardboard, veneer, or paper so that they reach right to the edge of the ship and, if the model so indicates, project a short distance over the end of the thicker wooden piece.

It is advasable to paint the edges of the narrower decks black before putting the paper or cardboard pieces on. Detat's such as portholes and duors may be indirated on the black edges with white paint, while thin pieces of wire may be put in along the edges to represent the deck supports, if desired.

rewing necessity make good mas, a for ministure ships. Beads are useful; they make good crow's pests, winches, and antenna insulators. Portholes and small lettering can be added with an ordinary pen and black and white inks. Rigging of fine silk thread will add greatly to the ship's appearance, and it is easily put on with transparent cement—H. J. C. Bronts.



# CIGARETTE TINS HOLD SANDPAPER SQUARES

Sanopapen squares are usually kept in an exposed, dusty, unassorted pile in the average home shop. It is much better and more economical to store them in flat tin eigeratte homes of the type shown. These are exactly right for sandpaper and keep it straight, clean, and dry. Numerals can be cut from old calendar sheets and glued to the covers to indicate the grade of paper in each box.—F. W. B.

#### DENTS IN CELLULOID

When a prog-poor ball has been dented or crushed, it can often be restored by dropping it in boiling water. The same method may also be used with celluloid toys, provided they are not cracked or broken in such a way that the air has leaked out.—Clara Ephrom.

# STAMP HINGES SUPPLIED ONE BY ONE

HINGES.

PAPER

Title transparent gummed stamp langes used for mounting postage stamps in an album are difficult to handle because they stick together and out of the box in which they are sold. If the box is of cardboard like the one shown, it is better to keep them in the box and remove them one at a time with the tip of the forefinger through a niot cut with a razor blade in one end of the box.

A convenient method of removing the binges is to place the box on the edge of a table or desk with the slot overhanging the edge slightly. The ideal way however is to make a stand from thin wood, plywood, or pressed wood, as illustrated, and glue the box to it.—W. B. W.

Coing to build a ship model! Then turn to our kil list, page 82



obstructions from rifle harrels have been used, but the most reliable way, in my experience, is to solder a straightened-out fishhook to a very stiff wire and force this miniature harpoon down the barrel and into the rag. This removes the rag in shreds and occasionally will pull it out whose if both the rag and harrel are well oiled.—J. A. Noviski

Shaded lamp attached to small band saw so that the cutting line can be followed assily

#### HOW TO INSTALL LIGHT ON BAND-SAW TABLE

For accurate work, a band saw must be well lighted. If you are using a saw without a special lamp provided by the manufacturer, the problem of placing a light so that the line being followed will not be in a shadow can be solved as shown above. A porcelain socket is bolted to a Frasa strip 1/2 in wide and long enough to go around the frame, and 14-sn, hoses are drilled in the two ends of the strip. The ends are then turned up, the strip is wrapped around the frame, and a stove bolt is caused through the holes. To prevent the light shining in the operator's eyes, a shade of tin is fastened to the brase strip with soider. The light is controlled through the same switch as the motor that drives the saw

A similar installation could be made on a drill press or other machine where a light is needed to exactly the right spot Only a little ingenuity is needed to make such improvements.—Dantet Revisions

# HAND TRAP GIVES HUNTER PRACTICE

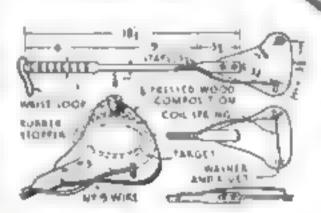
This band trap for they pigeous should appeal to every hunter because it enables him to make a few practice shots before going afield. It is equally useful for any one who wishes to entrove his marks-manship or to practice for a trap-shoot meet

The headpiece is cut from a 6 by 7 in piece of 1/4 in thick pressed wood composition board. The smooth side is kept

sition board. The smooth side is kept up for the face. Probably 14 the plywood or a piece of stiff sheet metal would serve equal-

The hand trup with a clay pigeon ready to be howen A were apring books the

milered lightly in place

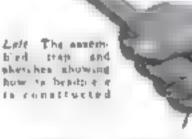


ly well. The handle is 18½ in, long, I turned it on the lathe, but a section of broomstick would act the purpose. Tape could be wrapped around the grip instead of cutting grooves. A slot is cut in the end of the handle for the headpiece, which is attached with two 1-in. No. 8 screws.

The rubber bottle stopper is attached to the bead as shown with a fivepenny nail which passes through a washer or the opposite side of the board and is riveted. The spring on the back of the bead bolds the clay pigeon in the trap if the massle files out too easily increase the tension of the spring. The spring I used requires about a 5-lb pull to move the wire to the outer edge of the slot in the headpiece. The dimensions given are correct for the standard clay pigeon, which is 41% in in diameter.

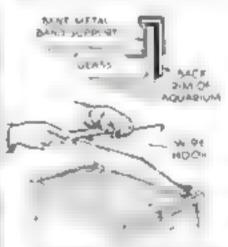
A reasonable amount of care must be taken in placing the targets in the trap. Rest one edge against the rubber bottle stopper and turn the target in a clockwise direction until it rests against the end of the wooden handle. If it is desired to make the head a little heavier, this can be done by attaching a piece of metal to the

taching a piece of metal to the anderside.—C R MELLEN



# THIS AQUARIUM COVER NEVER DRIPS





The cover in se in place on that the reat edge term on two books attached to the cim as shown to the drawing

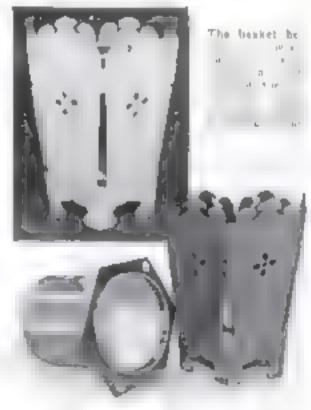
Water in tropical fish aquarisms must be kept warm all year round. This means that the water frequently is many degrees warmer than the air in the room. As a result, moisture collects on the undetende of the cover in large quantities and when the cover is removed to do any needed work on the tank, the drops of moisture, sometimes amounting to nearly a cupful of water on large covers, invariably run off the edge

The remedy is to support the tear edge of the glass at a lower level than the front edge so that the drops of moisture will roll off and back into the tank as fast as they form. The accompanying drawing shows how to bend sheet metal hooks so that the rear edge of the glass top is supported unside the tank wall and below the front edge, which tests on the top of the tank frame. The length of the glass, of course must be reduced so that it will just clear the inside edges of the ends of the tank.

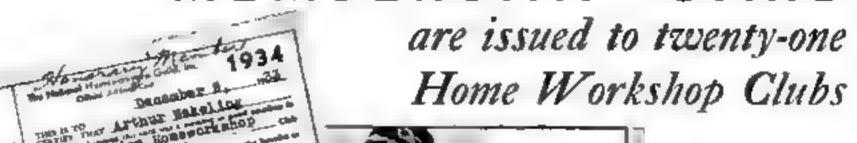
To hold the glass up when necessary, I use a staff ware bent so that it can be hooked over the front edge of the glass and with the lower end bent to catch in the cement under the angle iron in back of the tank.—W B. WINTER

# MADE ON JIG SAW

Cur on a just saw from sister, plywood this waste hasket is becausonally shaped 12 in, wide at the top and tapering to 10 in, at the bottom, Each of the six sides as 6 in while at the top and tapers to 3 in. The height is 15 in. An inner basket is made of copper screening as shown in one of the views below, and may be removed for employing.—The books Jerranes



# MEMBERSHIP CARDS



Every member of a Guild carb receives a card sim-Har to that shown above It is a passport to the naw fraternity of home eralumen and conveys all benefits of the National Homeworkshop Qualit, Inc.

President Ryder right, and Sectionary DeLong with a blu men thought quereprtion of sarly inquiries in sagard to organizing clubs

ARDS in the National Homewerkshop Guild. Inc., have now been moued to the charter members of the first twenty-one home workshop clabs organized under the auspices of the Guid. Nearly 1,000 men in about 400 different communities in the United States and a score of cities and towns in Canada have expressed an interest in forming local clubs. To each of these the Guild has issued full instructions in regard to eligibalty, obtaining names of prospective members, where to hold meetings, how to call and conduct the first meeting, how to organize on a permanent basis, and related matters All this has been accomplished in less than two months after the first announcement of the Guild appeared in Portitar SCIENCE MUNTHLY

Some of the clubs have already held their second and in a few cases, their third meetings and have adopted a constitution and by-laws based on the model supplied by Guild headquarters. One club doubled its membership at its second The Tupeka Homeworkshop Club, which organized with twenty-two chartet members, has already added nine The Denver Homeworkshop Club also added hine members at its second regular

The Amarilla Homeworkshop Club of Amardio, Texas, which started with four teen charter rammbers, took a poll and found that its membership included the following occupations electrical engineer. deutist, science teacher, manual training matructor, laborer insurance agent, chemical engineer, retired merchant

The officers of the Topeka Homeworkshop Club are a pharmacist, printer, hardware merchant, and engineer. At one of the meetings of that club a member displayed a collection of more than 100 varieties of wood and explained the characteristics and uses of many of them.

Each club meeting so far reported has

Clyde Safford, Rockford Home craft Club, busy making toys The Amateurs Home-workshop Club of Eschmond Vn . decided that must construct a toy for a child

ADVISORY COUNCIL

Professor Coding P Bl.sa Then at the College of Engineering

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Maj.-Gen. Benj D. Foulous Chief of the Air Coeps, U.S. Acmy

Capt. E. Armitage McCann. Fannier Ship Model Maker's Club

Dr. Francis G. Pease Artemanere, Mt. William Observotore

Frank A. Vanderlip Banker and Publicist, New York

been a revelation in the caliber of the men who attended and in their enthusiasm. Much special tulent in craftwork has already been discovered among their members. In many cases it became quickly evident that the difficulty would be not so much bow to find interesting and informative programs, but how to take advantage of all the knowledge and experience available within the club itself. Some clubs have even suggested meeting once a week instead of every two weeks. In one case it was definitely decided that the business meetings of the club would be beld every two weeks, but there would be an informal get-together at one of the members' shops between the regular meetings.

First Roster

of Local Officers

Announced by

The

NATIONAL

HOMEWORKSHOP

GUILD

The most surprising thing of all has been for club members to discover that some neighbor whom they have known for years in a casual way was also a home workshop enthusiast. This has happened frequently. It is certain, in fact, that anyone who starts a club will quickly and congenial companions to pursue his hobby with him. For full information, full out the coupon at the end of this

E. Raymond DeLong, secretary of the Guild, has had to answer many questions in regard to the work and scope of the Guild and the organisation of local clubs. A few typical questions and his answers

Inquiry Does the Guild embrace al, craftwork? Auszer Yes,

luquery May women be enrolled as club members? Aurant Yes.

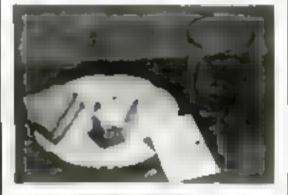
Inquiry: Are there any testrictions as to the number of clubs formed in any one locality? Answer. There are no restrictions, but the Guild advises discretion, except in the [Continued on page 96]

"BLACK LIGHT"

Experiments

EASILY MADE WITH LOW-COST LAMPS





Chesse, butter and a Chinese white cross, pa took on a raunder. These were photographed in white night, they so black

It a glowing jewel, converting lubricating oil to a liquid light, and discovering whether your friends have any dead teeth are but a few of the mystifying tricks you can perform with "black light" produced by inexpensive equipment. This light is a near-ultraviolet radiation that is invisible to the eye. Its power to make various substances emit light of a visible color causes these magic effects.

Several inexpensive ultraviolet light sources can be used. The ordinary in candescent lamp produces some ultraviolet but is a comparatively feeble source A 35-cent photofood bulb is much better occause its filament operates at a high temperature. This lamp burns about two hours on a standard lighting circuit. A still more powerful source is any of the various aun lamps of health lamps, such as those employing the so-called S-1 or 5-2 bulbs, or carbon arcs

The filter suggested by lighting engineers at the Nela Park Laboratories of the General Electric Company for absorbing practically all the invisible rays from I lamp, while permit ing the ultraviolet to pais, is a piece of special glass known as "purple ultra-heat-resisting glass." This costs about \$3.25 for a piece 6½ in square. It should be mounted so that it will not be broken by a blow or by strains resulting from clamping, and it

Using a filty cent argun growcamp to many no minera a that give of light of various bucs

the lamp. Another thing to remember is that the lamp, porticularly if one of the photodood or sun-lamp builts must be well ventilated to prevent damage.

A sample way to fulfill these conditions as to construct a wood frame, say about 24 in square, and stretch a piece of ordinary screen wire over it. Cut a mask of heavy card-board or asbestos, making the center opening exactly the sate.



 $\mathbf{B}_{\mathbf{y}}$ 

Walter E.



Interior decorations prepared with fluorescent parts as they appear in ord namy aght and the lower view of united of dismonation. Left Sug samp with special filter

of the piece of special glass. Lay the glass on the screen wire, place the mask bround it, and, if necessary, add a second mask that has an opening slightly smaller than the glass, to keep visible light from escaping around the filter edges. Then place a second piece of screen wire over the glass and masks, and tack the edges to the frame. The glass is thus sandwiched between (Continued on page 91)



# DONALD W. CLARK tells how to whittle out a model of the

# World's Fastest Racing Plane

Model of Macchi-Casolds seep and used from white pine seeps for propel ery and tail dotte, which are of the metal

HE world's fustest airplane, the Italian Macchi-Castoid seapiane which recently
clipped off the extraordinary
speed of 440 miss; an hour, is an imusually interesting design for model mak-

Only seventeen units are required, or eighteen if the propelier spinner is cut in two. The parts are nailed together or

fastened with give or household cement. Plane a white pine blank to the size given for the fuselage and shape it with a fine-toothed saw and a sharp knife. Smooth it up with sandpaper. It is easier to cut the tail alots and the wing recess.

are true. Cut in pockets to take the struts, which are set in glue. The struts can be cut from thin wood.

The tail units should be made and at-

The tail units should be made and attached in the usual manner. The head-rest cowling is glued in place. The wind-hield can be made of celuloid, or yellow (detail) drawing paper will serve.

Cut slots into the spinner to take the propeller bades and give them in

Give the entire model a coat of medium gray. Use light red over this, leaving the seven radiators, cockpit, and nose cowling with spinner and propeders, gray. Stripe the rudder as indicated,

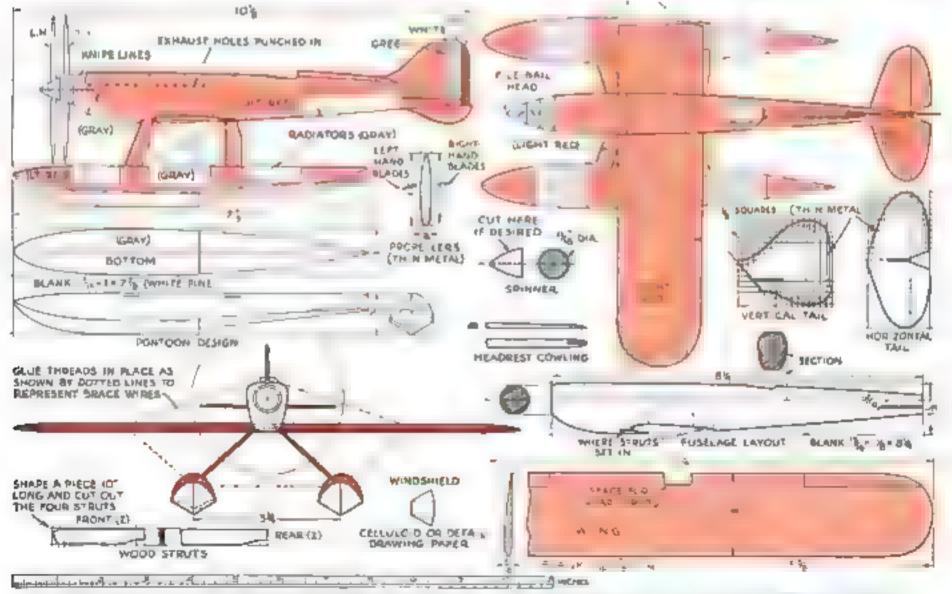
in the block before shaping Mark where the struts go, and at these points cut in and dig out with a knife point, or use a drill for this.

Make the wine in one siece.

Make the wing in one piece and ht at accurately to the fuselage, to which it should be natled or gloed. Shape the pontoons from blanks squared to the size given. Smooth them well and make sure the curves



The pasts ready to be put together. The ap one may be our in two or of whole and but to marked



Side, front, and top views of the assembled model and detail drawings of the various parts, with an inch scale for finding any desired dimensions not specifically marked. When built the asse suggested, the scale of the model in comparison to the fair-size plant is \$\frac{1}{2}\$ its equals \$\frac{1}{2}\$.



# HINTS ON MAKING SALABLE ASH TRAYS

AsH trays are easy to make are alway in demand for gifts and prizes, and it is often possible to sell them at a profit

If you are a beginner in art-metal work. it will be well to start with lead. Three heaten lead trave are shown below. Each one is made from a disk of 3 32 in sheet lead 4 in in diameter and is handwered into shape with a bad-peen hammer. working from the insue-

The first ash tray in the group at the

top of the page is of 18-gage soft sheet copper. It is hammered fiat then bent into shape over a wood block. The secund is 22-gage copper This is not hatemered but is shaped over a 1/2an rod head in the vise as flustrated The third as brass and the fourth copper. Both are shaped in the same manner as the lead

The lead trays are left plain. The brass one is merely polished and lacquered. The copper trava are

a quart of water and immersing the trays quered.-Dick Hutchinsox

Positive the flater of the coupe g icas from land

colored in a solution made by dissolving until they turn brown. Then they are a small piece of liver of suiphur in about washed, dried, carefully polished, and lac-

# UNIQUE SMOKER'S SET MADE FROM THIN SHEET LEAD

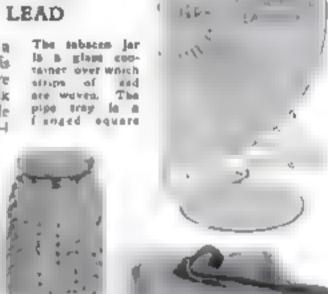
Frost a 1-pt, saled dressing par and a small sheet of lead 1/16-in. thick it is possible to make a novel and decorative pipe smoking set. Lay out a 15-in. disk of lead and acribe a 234 or 3-in, circle n the center, Then lay out and cut 34

radad strips 54-in, wide as shown Next prepare a 1/6-in, wide strip by cutting around pnother disk until you have a piece 14 ft long

Hind a piece of friction tape around the shoulder of the jar to prevent slipping. Set the far in the center of the 15-in, pattern and bend every other strip up Run the 1/4-in strip around over these; then bend the others up. and the first ones out. Repest

until you have reached and rounded the shoulder. Cut off the underneath strips at this point. Run the 1/4 in, strip around again; then bend the others down over this dist weave. The cap. 334 in, in usameter, is bent up around the lat jor capagainst the edge of the bench.

The pipe tray is 6-in, square with the corners retarded. A rim 1-in, wide is bent up all around, and half of this is bent out and pressed down with a piece of softwood,-T M. THOMPSON



#### TESTING DOUBTFUL GOLD

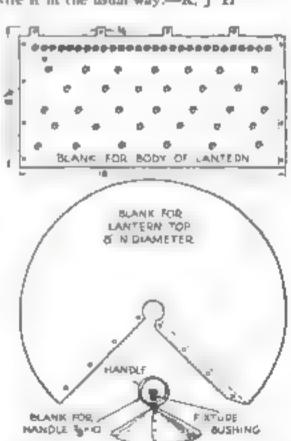
INITATION and spurious gold may be discovered by placing the sample in an pir-tight box in which there is a glass or porcelain dish containing a small quantity of iron sulphide. The sulphide is covered with hydrochloric acid, and the box immediately closed. After several bours the sample, if spurious, will be discolored.



# OLD COLONIAL LANTERN IMITATED IN COPPER

To MAKE the body of this reputa of an early American lantern, cut a blank \$14 by 16 in from 24-gage soft sheet copper, with four lugs on one side as shown. The paces may be merely punched with random holes, or a design may be outlined and punched out. The punching is heat done with a sharp-edged nail set on a steel block. When this is completed, roll the piece into a cylinder and rivet or sorder the cap joint

The cap is cut from mining material bent into shape, and riveted or so leter-Hours are drilled to correspond with those on the lugs, and the two pieces are riveted together with No. 14 hrass escutcheor puns. Cut a strip of 16-gage copper \$4 in, wide by 10 in, long for the handle, bend it into a ring, and rivet the ends together. After drilling a 36-in, hole through one side of the ring, attach it to the cap with a Moin, fixture bushing Leave the lantern in its natural finish and wire it in the usual way.--R. J H

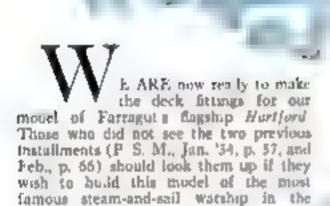


How the blank metal and out The boles may be punched at random or to form a design

## Deck Fittings and Guns for Our

# HARTFORD Model

By Captain E. Armitage McCann



United States navy Suppose we start amidships with the funnel assembly. The funnel is 1 in in diameter and rakes the same on the mainmust. A piece of beaus tube or even a wooden one would do I made mine from a thin piece. of sheet brass, winding and binding it round a wooden form filing the edges quite thin, and soldering the foint. A Mon strip is soldered around the top edge. Through this I drilled four boles to which I soldered eyebolts. The funnel will be navy stone color

The base, or fiddley, is an oblong block 3q in thick. On it are two grating hatches, and abaft the funnel are two ven flators. The latter can be carved from wood or cast. There are a number of gratings so it is worth while to develop a good way to make them. The bars and openings cannot be too small, because in the real grating they are only 1,4 m. The most tedious but most satisfactory method is to half lop strips of beawood. They can be made by cutting a form and molding them in plastic material, or by using threeply wood, or by punching square holes. This assembly is best laid aside until the model at nearly completed. When put in position, half down a piece of wood to fit the inside of the funnel and give the lunnel to that.

There are four plain grating hatches if the same height, as shown on the deck plan published last month. I made these

Captain Diayton (left) and Admito) Farragut at the while of the Natified—drawn from an old photo



In circle Looking down past the after end of the forecastle towards the foot of the forement. Above: More deck fittings

from solid blocks toto which the gratings are let in. Then there are two companionway hatches—the second from forward and the aftermost on the main deck

The tunnel at het up up Cantain McCann & model. It reve up an oblung block which a so extress two graing hatches. Note the ven larger the small be I on the mainment, and the anchor che up

I built the sides of these and let the gratings lie in rubbets. Over them are truss wires, these are to spread turpaulius in wet weather. I let the wires into the edges, then notched where they crossed and there put a drop of solder. These wires and hatch sides will be whate; the others black with teak color statings throughout

If you want to go to a little extra trouble, instead of putting the gratings on these

hatches you can have them open, showing crossed lauders to the benth deck below as in the sketches on page 92

The Hartford hove her anchors in with the old-style confer deck capstan. This can be seen at V in he deck plan. This can be cut from a piece of wood, with a separate piece for the pawl rack and flattened pin points for the pawls. The top and bottom will be black with dark natural wood for

the whelps (cut out middle portion). A similar but smaller copstan N2, 1/2 in. high, stands on the forecastle head.

We have (Continued on page 92)

# Triple-Dog Tripod

WHITTLED FROM ONE PIECE

By E. J. Tangerman



RITTLING a tripod in one piece, usually in the form of dogs but occasionally like intertwined shakes, is an old, old trick of Oriental or West Indian origin. I have seen several examples brought from Jamaica and other parts of the West Indies, and have heard of such tripods being used to support crystal had and incense burners. Everyone interested in whittling, should learn to make these

The shapes, of course, do not have to be copied with microscopic accuracy. In fact, no whittler would make two tripods exactly the same 1 is true nevertheless, that all the dog-type tripods I have seen have been almost identical in respect to the head and foot denges, and the sements are likewise identical.

A hard tough wood should be chosen, because most of these pieces, when finished, are pressed into service to support trays or ornaments and must therefore bear a little weight. The very nature of the design places the weight across the grain, and there is considerable atrain at the ends of the rude link forming the animal's body. I have made a number of these tripods, usually in red mahogany which has a reasonably dense grain, gives a good appearance when finished, and is tough enough to take the fight strains imposed upon the tripod in use.

White the piece, both when finished

and in the drawing, looks exceedingly intricate, it has a regular design and will be found easy by the whittler who has made the familiar chain or ball-in-a-cage and similar pieces.

The block from which the tripod is to be whitted is cut to a rough betagon. One of the drawings shows the arrangement of the dogs' heads and feet. The heads take up each alternate corner at one end of the block, and the feet occupy the corners farthest away at the other with the body passing diagonally between

It is easiest to begin by whitting the beads and necks rudely to shape at one end and the legs at the other, remembering all the time that the corner at a dor's note on one end will be blank at the other end of the block. When the legs and heads are roughed out, the center



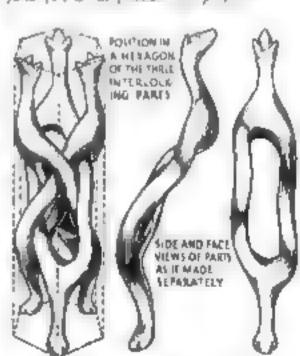
Small ask tray realing on a triped, which is higher than the one hold og the metal how! because less wood was cut from the dogs

away. If that abould happen, one of the other bodies will be too weak to support its share of the load. When one body has been roughed out, continue from point to point all around the block.

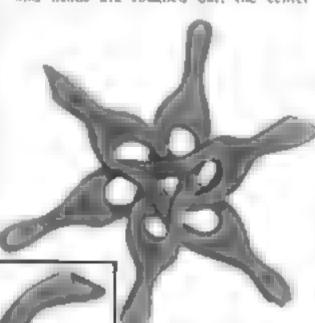
This progressive what ing is continued until the outlines are all smoothed to shape. Probably the water blade of a penkinde will be required to separate the various bodies. When they are separated, they are smoothed up and thinned to the thickest shape which will allow them to be spread open as shown in the photographs. The heads and feet are then himshed, and the whole piece prepared for heisburg by sandpapering. I have found a lineed oil dip and waxing best to bring out the natural color.

The finished triped may bear a bowl or crystal, and either may be pinned in securely by passing a screw through the small central triangular opening, which can be seen in the photograph showing the top view. The screw should be set into a small wood brack. This is the method used to bold the small ask tray and the 5 in, diameter metal bowl. One impod—that holding the metal bowl—stands lower than the other because more wood was cut from the dogs' bodies.

For another whitting stant, see Mr. Tangerman's previous article on wooden fout (P. S. M., New 3 p. 75



The three dogs are cut in an erect position from a single hexagonal block of hard wood



Lefe How the tripod opens

section may be cut round and the lines of the bodies cut in roughly

Then begin to work from one head toward the diagonally opposite foot, roughing out the two sides of the body carefully so that too much stock is not cut

# There's the "Date-line." It tells you Eveready Batteries are FRESH AS A DAISY

Your flashlight battery is really "packaged electricity" . . . electricity produced from six powerful chemicals of the type that Science knows as octor. Naturally battery service is best when these chemical elements are FRESH. Then they have more pep and punch.

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heer" that keeps the balanced mix of six active light-making elements in hair-trigger alignment ... and a strong metal top that prevents power from leaking away when the battery mo't in use.

A lot for your money? You're right! And you get that same natisfaction whether you hay Eveready Batteries to use in a flashlight, in a radio . . . or to power the ignition in a motor boat. National Carbon Company, Inc. General Offices, 30 East 42nd Street, New York, N. Y.

UNIT OF UNION CARRIDE AND CARRON TITL CORPORATION



THEIR FLASHLIGHT EVEN WORES UNDER WATER—Of course it seemed impossible that a light could be lit under water, and Mabel Holt\*, but there it was, our long range focusing flashlight Charley\* dived, got the flashlight, and climbing on the bottom of the upturoed boat, flashed the light until help came.



Millions of unwired radios are powered by Everoady Air Cell "A" Betteries and Layerbilt "B" Betteries. Everoady Dry Cells serve hundreds of mers in the home and industry



\* DAYS ADMITT THEN FLASHLIGHT BRINGS
RELP—George T Barner" (right) showing Caplam Henry" of the rescurship, the flashlight which saved his life on the eighth day of helpless drifting "Three times I sighted ships in daylight but they couldn't see me," and Barnes . . . "but at night, my flashlight saved me."

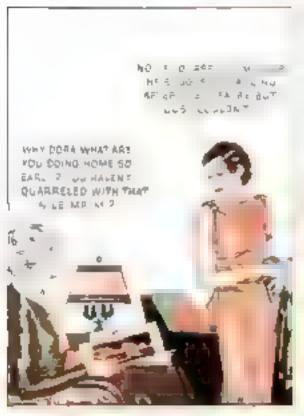


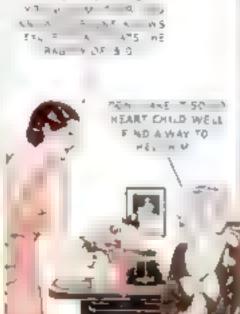
SHE—Why Tom Martin! I believe you re alread of the dark in the attic. HE—Afraid nothing! I'm playtic min arount a twisted angle.

HE—Afraid nothing? I'm playing safe against a twisted ankle on these loose flooring boards up how.

"Not their real names, of course, although these were given in the court-to-court newspaper report.

#### A MATCH-MAKING MOTHER





F ATHASE THE









HERE'S THE SECRET
OF COUNTLESS
LOVELY COMPLEXIONS

FRESH, rediant, "Miss America" complextions — how do they come to be? The antwer in thousands upon the

twer in thousands upon thousands of cares is Lifebra. This popular toilet scap does wondens for the skin. Its gentle lather dep-change ports—bridge out natural loveliness

#### "B. O." never warns its victims

How easy to offend unknowingly—especially when rooms get overheated! Let's play sate—bathe regularly with Lifebuoy. We can tell by its quickly-vanishing, hygienic scent that Lifebuoy lather purifies and deodorates populations. B. O." (indy safe).

Approved by Good Hannington Brown,

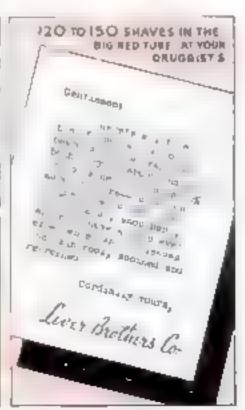
#### HINTS FOR HARD-TO-SHAVE MEN











# Curtains and Scenery

### for dressing up a MINIATURE STAGE



By Benjamin W. Hicks

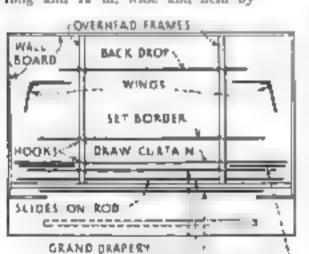
WYONE can build the framework for a ministure stage but it requires notice knowledge of actual theorical practice to dress it up with curtains and scenery in the style of a professional scenewright. The accompanying illustrations show how that may be done.

The construction of the stage itself was described last month (P.S.M. Teb. 34, p. 57), and all the dimension given in this article are for that stag Everything is to the scale of 1 in, equa-1 ft. The same methods, however, can housed in making currains and scenery for

any miniature stage

By studying the drawings and illustrations you can learn the relationship of the different parts of the equipment and a where each piece goes when finished. A the hanging pieces are hung from frame above the stage with wire book. By choosing mill samples or ends that are too short for regular use you can obtain most of the material at a reasonable price from a drapery shop. Velous, velvet and samillar materials are best, for they take light well and are rich in appearance.

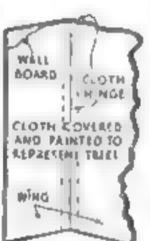
The valance is necessary to mask off the top of the stage 11 is 36 in ong and 12 in, wide and held by



Simplified plan view to about the names and approximate position of curtains and accord

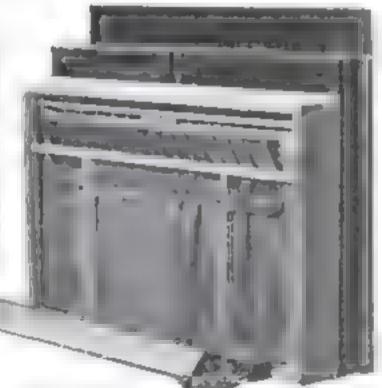
VALANCE . . ..

TORMENTORS





Minimum stage well on the prace of 1 nch equals I foot, with complete set of curtains. At Iris. Typical wing made of cloth-covered well build



EASILY STORED Large stage cay be projet com-

double battens at the top, as shown in onof the drawings. First cut two small bar tens each 14 by 34 by 36 in. Take a piece of lightweight material 14 by 54 in. and rut out the bottom edge as shown in the shotograph on page 87. Hem this and timish the bottom effee with a fringe, A suitable fringe about 13/2 in, unde may be purchased at a ten-cent store. Mark the center of the material and batten, and pin in pleats about every 3 in. When these are even, fasten them in place with one tack through each pleat. Attach the other lighten to bold the majerial without danger of its tearme out Drill boles 6 in from each end and hang the battens with wire A prease per to the values above to the terms of the term



hooks from the frame on top of he stage (see photo, page 87)

The front curtains are made next They should be of the same material as the values C at two mass each 20 by 24 in. Turn a 1 in hem on all sides, leaving the bottom bem open so that a small chain or weight may be can through to make the curtain hang straight. When finished each curtain will be 27 by 22 in Sew on a fringe to match the values, and hang. You may use either a traverse rod or a regu-

far cuctain rod. These curtains are hung directly behind the valance

The grand drapery is made in the same manner as the valonce except that the bottom edge is straight and is 40 in long when finished. Leave about 4 in between the front cuttain and the grand drapery when hanging

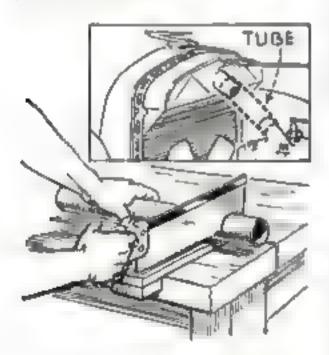
Tormentors are used to mask the sides of the stage and should be made of the same material as the grand drapery. As these pieces must stand alone, build a frame 7 by 21 in and tack the material in place, allowing for pients. These frames may be made to stand by using small angle irons. (Continued on page 87)

FRONT CURTAIN (DEAWN)

Helpful Hints
for MOTORISTS

New Ways of Doing Things Described by Our Readers for All Car Workers

THEN lubricating a car equipped with a pressure system, one frequently encounters a tight shackle bolt that has become clogged with old lubricant. Being caked, ft forms a tight ping that resists the pressure of the lubricaling gun. To loosen such a bearing simply remove the weight of the car from the spring and tap the bolt with a hammer as the new lubricant is forced in. The free bearing, plus the jacring and the pressure, generally will loosen the old labricant, in jacking the car up, place the jack under the frame near the spring in question and raise the frame just enough to bring the wheel to the point where the tire is barely touching the ground -R. McC

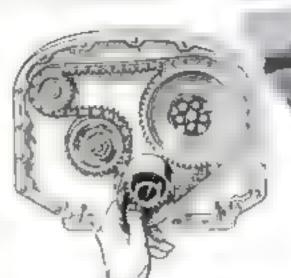


#### Cutting Rubber Hose

WHEN cutting new sections of radiator hose to the proper length, a neater job will result if you use an ordinary crosscut saw rather than a knur-Simply handle the piece of hose as you would lumber, holding it firmly in a vise or ordinary beach block. Saw slowly and with short strokes, applying just enough pressure to make the saw cut.—G. H. H.

#### Adjusting Timing Chain

READJUSTING a timing chain that has jumped a tooth oftentimes proves to be a difficult job for the lone mechanic to handle. At best, lifting the chain and turning the crank requires more than two hands. On cars having an automatically adjusted chain, however, the writer has found the following method to be successful. First, cut the top and bottom from an ordinary tin can that is slightly larger

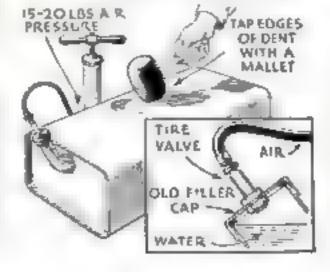


When a tight characte bult stops the lubri-

than the crankshaft gear. After the chain has been lifted free, stip the can over the gear. By preventing the gear and chain from meshing, the can will make it possible for you to insert the crank and turn the gear until the reference marks are in their proper locations. When the adjustment has been made, remove the can and the chain will then easily slip back into place.—R. M. C.

### Removing Dents From Gasoline Tanks

BY 1.51NG water air pressure, and a rubber or wooden mallet, you can remove small dents in a car's gasoline tank. After all openings except the filler pape have been plunted fill the tank with water and apply an air pressure of about lifteen pounds with either a hand pump or garage compressor. Then tap lightly around the dent with the mallet. The jarring, combined with the mallet. The jarring, combined with the pressure, generally will force the metal out flush with the sides. To apply the air pressure, fit a spare gasoline tank cap with an old tire valve as shown, inserting washers under the nuts to make it airtight.—J M V



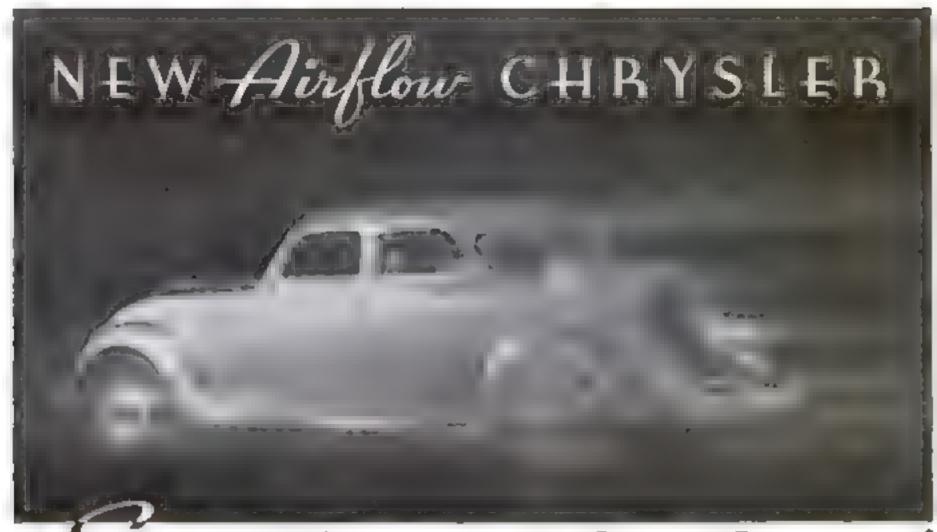
#### Anti-Steam Windshield

BUBBER SLOCKS

WITH some felt, a section of glass cut from an old windshield, two gasily made clamps, and a few blocks of rubber, you can fit your car's windshield with a valuable anti-steam glass. As shown in the illustration, the felt holes the liner glass away from the wondshield proper forming an air pocket that will preven. steam from forming and obscuring the driver's view when it becomes necessary to drive with the windows closed. The two clamps are fastened to the frame just above the windshield, while the two rule ber blocks are used as wedges to hold the lower edge of the glass in place. When not needed, the glass can be removed by loosening the thamb screws.-E. E. H.

#### Running Board Treads

AMATEURS get into difficulty when they attempt to replace running board treads that have worn through because the new material tends to pucker up in places. This can be overcome by weighing down the new rubber matting with a thick layer of sand until the cement dries. Incidentally ordinary sodium sticate, more commonly known as water glass, and used in preserving eggs, is an excellent cement for this purpose. It can be purchased in quart cans from any large grocer and will cost less than the same quantity of ordinary rubber cement,—D. J. B.



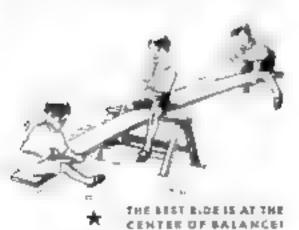
Streamline - with a Reason!

#### ... BIDE AT THE CENTER OF BALANCE OF A MOTOR CAR

MAGINE a motor car that actually seems to gnore the road it rons on . . . a car that lets you read or write as you ride at speeds up to 90 and 95 miles an hour

That's the Floating R de in the new Airflow® Chrysler, and the scient he principles which make it possible are easy to understand

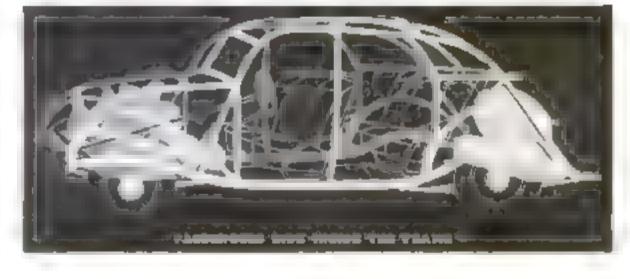
All the important weights in the car have been redistributed. The engine in sorr the front axle. The rear near in 20 inches forward of the rear nxle. Passengers ride in the middle of the car., . . exactly at the center of balance. . . . the point of least motion.



In addition, the "periodicity"—or rate of spring action—has been greatly slowed down. The motion of the car becomes a long easy glide... exactly like riding on a cushion of air.

No motor car in years has introduced so many scientific advancements as the new Auflow Chrysler. It is different in looks... different in action ... different in riding comfort... different in its genuine streamlining... different in its refreshing new beauty.

See the new Airflow Chrysler and nde in it . . . you'll get one of the thrills of a lifetime,



### Jour Distinctive

CHRYSLER AIRFLOW IMPERIAL. 190 http: "Note to be See-proceeder Broket and Town Arches, for the stages Compt.

AIRFLOW CUSTOM IMPERIAL 140 h p. 145 h h h magnificantly septed distinctions

produced the production of the

FLOATING RIDE BOOKLET PREE — Write for the interioring booklet which describe the tomantic Anniquement of Floating Fide Address the Christies Some Comparation, 12.20 East Indicator Avenue, Derrott, Mich.



# Striking Photomicrographs

VIEN without a macroscope you can make may good photomicroor phs of tiny objects and organisms up to forty-six or more diameters. Of course, if you own a microscope, it will aid in acrecting subjects suitable for photographics

The method is much easier and simpler han the standard one of photographing through a nucroscope. You will need a small hand camera with a good lens and focusing (ground-glass) back, which can perhaps be burrowed if not already available. A larger camera can also be used. out if your comers is of the roll-film type, it must first be fitted up so that a mece of ground glass can be used for focusing at the back and so that a holder for cut film, film packs, or plates can be attached. Then you will need an auxiarry lens of the type sold for copying which costs less than a dollar and slaps over the front of the regular lens, a cardboard mailing tube about 24 in long and of as large diameter as possible, several small pieces of plywood, some blackboard paint (or a dead-black mixture of shellae and lampblack), and a C-clamp,

hand the exact ins de diameter of the mailing tube and cut two plywood disks to fit spuggly Next unscrew the lens and shutter from the camera. If your camera is of the type having an upright support for the shutter he support is disengaged from the camera bed and laid aside. On the back of the shutter will be found

After the less and shuster assembly have been removed frum the cameta a p ywood d alt to accemed to the mera piata a the the take his on the

By

The lone is most ed in prother dark as above he ow and the d ak to tunerto- in the other end of the rule The whole art up uppeace at the tup of the page outen the photoflood amos used for fi amagation

a fens borrel that projects slightly and perbaps a threaded bushing. At any rate make a hole in the exact center of one of the disks to receive the rear barrel or bushing of the shutter. It should be a tight fit You will find that the mouth of the

ramera bellows has a metal plate. A how the same size as the one in the plate is made in the other plywood disk, which is screwed in place as shown in one of the photographs. Mix up the blackboard point thoroughly (Continued on page 79)

# Snapshots at Night!



KODAFLECTOR With trans, a december of as

# This 48-Page Book and a Generous Sample

#### BOTH FREE!!

Byery handyman, home-craftsman and manual-training student should have this interesting and helpful Gluing Guide. It contains dozens of moneymaking and money-saving ideas on building, repairing and mending things early and permanently. It tells how you can give everything to stay glaced ... in spite of moisture, best, rough usage or plain neglect.

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AT NO COST, you will also receive enough CASCO to do several gluing jobs. This is the same super-strungth, wonder-working adhesive used in big woodworking and furniture factories. You will be amused and intrigued to find that CASCO - a clean, non-odor ous powder-mixes so quickly in cold water, forming a creamy, easy-spread-ing gove that makes all jobe permanent, heat-proof and monture-proof.

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TEAR THIS OUT ... MAIL TODAY (Sava Za — stick it on a peary pest coré)

205 Shat 42nd Street. Plans send me my cr	the York, M. Y.  of of the CASCÖ Gloing your flow brist mangle.	1
Numer consumers		ď
Street-a. seasons		į
City	9teW	-Sá

#### A LITTLE

## Knockabout Table

Designed so that it won't tip over



Because of the design of its base and the way it huge the arm of an overruided that the table to much firmer than the average emel, ampling stand

PAUL H. NELSON



viils little table is patterned ofter one brought to this country from Sweden more than 200 years ago. It may be made of maple or alder, or with a top and bottom of fir plywood, or, if desired, of either veneered or solid walnut or mahogany, the uprights being solid in all cases.

A screw center is used in turning the top-The edge is finished to a 1-in, radius as shown, the top part being slightly rounded off to give a good finsh. If no lathe is available to swing the 14 in disk it may be saved out with a band saw by using a scrap piece of wood to hold a screw upon which the blank for the top is rotated to give it a truly circular form. The edge may then be finished carefully with a router or by hand. If equipment is available and the builder's taste runs in that direction, the nuter edge may be cut in scallops to give a pie crust effect.

The uprights are next turned from stock 154 in. square and about 18 in. long. The marks of the headstock center are cut off when the piece is cut to the finished length of 1716 in. After these pieces are turned to a uniform diameter of 114 in., the center is reduced to 36 in. and the ends to 36 inamouth curves join the different diameters

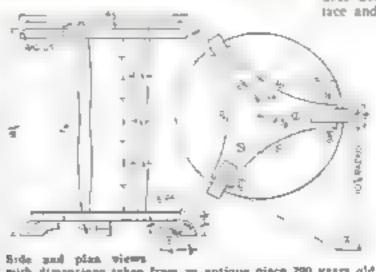
The two end portions are extended as, one fit into Hain, holes bored in the top and bottom pieces

The bottom parce is next laid out on a piece of 1/4-tn. stock 12 in, wide Its form is based upon an equilateral triangle, the concave sides being area of circles. The aprights are set in another equilateral triangle of smaller size. The layout is begon by laying out a distance of 17% in, with a distance of 1015 in, on either side of it along one edge of the stock. With the outer end A of the 10% in space as a center, an arc is struck from the end of the 17s-in, space B until a chord SC is also 1014 in in length. The other two sides are laid out in a sim ar manner The center of the piece is then found he striking area from the centers of the flat portuna of the edge, and the holes for the uprights are located 5th in from the center in each of the three corners at shown. The bottom piece may now be sawed out and the top edge rounded off on a la-in, rad as-

After the holes for the uprights have been bored with a 14-in, bit, the piece may be used as a template to locate the holes in the top of the table. Care should be taken in horing these holes that the spur of the bit does not penetrate the finished upper marrace and spoil the top ent-rely

The three feet are sawed out of 1 4-in, stock and fastened to the bottom piece with pails or screws. The uprights are glued into the top and bottom, and the table is ready for sanding and finishing

The type of finish will depend to a certain extent upon the wood used. The original is a bardwood finished in walnut stain. Maple may be finished to match the early American furniture now so popular and protected with a coat of shellar or wax well rubbed in. Pa nt or lacouer would be suitable for bedroom use.



with dimensions taken from an untique piece 200 years old

#### YOU CAN TAKE STRIKING PHOTOMICROGRAPHS

(Constaued from page 76)

and with it coat the inside of the mailing tube. This may be done easily by hosting one end to the light and painting with a bresh ted to a long stick. Also be sure to blacken all parts of the wood disks that are exposed on the inside when they are fitted in the ends of the tube.

The outfit is then set up as shown at the top of page 76. A wooden cradle is used to support the making tube, and the camera belows is drawn out most of its length. A good place to assemble the outfit is along the edge of a workbeach. Be sure that all parts are steady and without possibility of vibration hasten the bed of the camera to the beach with a C-clamp.

THE best mount for the specimens to be photographed is a box about 3 in, square with one side painted dead back, or a minuteture easel may be made. In any event the surface must be all black. A light colored specimen may be mounted directly on this surface, to mount a dark specimen, first fix it to a lift of white cardboard po larger than a biin, square which is, in turn cement is to the black surface. A dab of water glass is a good cement for this purpose because it dries immediately. If the specimen is prepared on a illde for viewing by transmitted light, cover a I but the middle of the slide with black paper and count it over a hole drilled in the black mounting surface. The light can then be placed in the rear

The spectmen is first focused roughly with the lens wide open by either moving the tube back and forth or placing the mount teners or further away. The author uses a photo-flood lamp in a reflector at each side and slightly in front of the mount. When the focus is found, close the lens clown to F 32 and make the exposure. A rough guide for he latter light objects, from 5 to 10 seconds, mercam, 10 seconds; and dark, such as the head of a fty, 11, m notes. These are approximately correct for an average camera lens and chrome type film provided the photoflood light are parced about 15 in, from the sut rest

With no outfit of this kind, a magnification of about twelve diameters is obtained. By placing the negative in an enlarger, clear prints showing an enlargement or magnification of or a six diameters are easy to make, in fact, the negatives may ensity be enlarged much more than this without loss of detail. The three sample photomicrographs were all taken with a 21-in tube and are the actual negative eige before further emarging

A fer the reader has seen how easy it is to make I hotomicrographs in this manner how ever he is advised to use a much longer mains use to separate the lens from the camera Magnification will increase tremendously with the addition of several jaches. The exposure must be lengthened accordingly

If you were one of the hundreds of readers to he submitted entries in one November Photo Contest turn to page 5p for the announcement of the tenners.

#### GLASS CUT ACCURATELY WITH BROKEN FILE

When ord sary glass must be cut to exact measurements, it is difficult to judge distances with an ordinary glass cutter used along a straightedge. A satisfactory cutting point that can be used with absolute accuracy can be made from a three-cornered file. Place the end in the jaws of a vise and enap it off swartly. This will give three cutting points, and when they are worn down it is merely necessary to stap off another short piece.—G. G

# For Snapshots at NIGHT



... with the new SUPER SPEED FILM



35°

USE

THIS

LAMP

All you need is a camera with an F/6.3 (or faster) lens (use wide open); some of the new super speed film and a few G-E MAZDA Photoflood lamps in your light sockets. Then you are ready to take snapshots of the family circle, friends, parties, children ... AT NIGHT!

G-E MAZDA Photoflood lamps are good for two hours of picture-taking . . . good for dozens of pictures.

Get some of these lamps and some of the new film from your druggist or camera dealer and enjoy \$NAP\$HOT\$ AT NIGHT! General Electric Company, Nela Park, Cleveland, Ohio.

FOR ACTION PICTURES and shots of babies and pets, use G-E-MAZDA Photoglash lamps. They operate simply, in light socket or from flashlight batteries. Enable even box cameras to get good indoor pictures. Each lamp gets one picture. Retails for 15 cents.

GENERAL ELECTRIC MAZDA PHOTOFLOOD LAMPS



# EVERY HOME CRAFTSMAN SHOULD FILE HIS OWN SAWS

THE main idea of home craftsmanship is to be able to do things for yourself. And yes, many skillful home tool users do not file their own saws. They put off work until they can get saws sharpened by someone also because they think saw filing is difficult, mysterious work.

Actually it is not. You can learn to sharpen your own mws quickly and without difficulty with a Nicholson Shim Taper File made especially for sharpening saw teath, shaped to fit exactly between them, and capable, in your hands, of giving renewed bite to the dullest saw.

Every bome craftsman should file his own saws. Go to your hardware dealer and get a Nicholson Slan Taper File. Nicholson File Co., Providence, R. L., U. S. A.





# Building Garden Tractors

SOME of our readers are saving work in themselves much back breaking work in their gardens by using small traction built from old engines and junked parts. This was made clear by the large number of excellent entries received in our garden tractor content (P. S. M., Aug. '33, p. 761, Prizes have been awarded as follows.

FIRST PRIZE, \$25-William Tanger Be seconts on Ohio

SECOND PRIZE, S13-J. Wahl, Pottstown, Pa

THIRD PRIZE, \$10-Albert Brown. Cha-

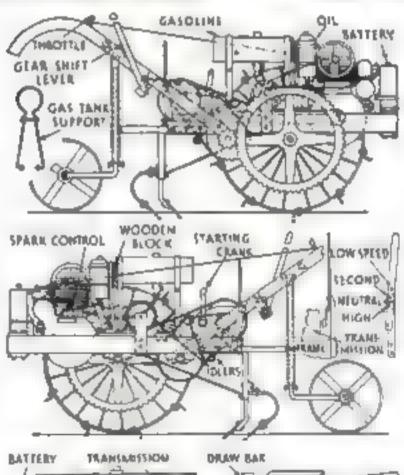
HONORABLE MENTION Robert & Beasiey, Camden, Oh Donald Beckner

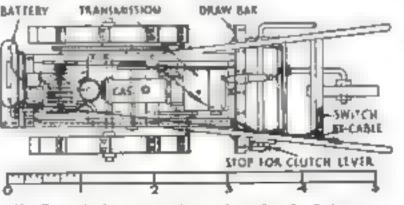
South Lancaster, Mass, Starling and Herbert Cahal Danville. Va. John & Cote Arnes are Mass. B. J. Cotatt Battle Creek, Mich. David H. Depaie. Ann Arion M.ch. E. M. Hawes, Marketta Ohio Arthur E. Hayes. H. Maske. Ohio Arthur City. N. J. K. Karerovsky. Codar Rapids, Iowa, Makin C. Metzer, Silver Creek, New A. W. Nurth. Fond du Lai Witt, Carl W. Schick West. Toledo, Ohio, H. A. Tronman, Lewisburg, Pt.

The power plant and transmission assembly of Mr. Tanger's tractor were aken from a 1926 model, 3 4-11 m, she cie cylinder motorevelo of standard make. The tractor has three speeds—134, 205, and 344 miles an bour. The which have sufficient traction to cylinder a 42 m strip, but ordinary, a 19 of 26-in drawhar is usen.

A 4 o breaking prowserves as a farrower and six I , in collivative weeks are used for general custivation. In hot, day weather, a plain sweep har sharpened on one edge is substituted for the cultivator steels By running the bar about 2 in anier the surface, every weed is destroyed, the surface is loosened to save moisture but the damp soil is not thrown out on top to dry

The tractor is so well had anced that lo cultivating it will so 20 or 30 ft. without





Mr. Tanger's drawings with a scale in feet for finding any dimensions. These, however will vary with the parts stand

being touched. It was run four or five hours on I gal, of gasoline and I pt of oil. The cost was \$23.50, of which \$13.05 was for the environ, transmission, chains, sprockets, and rear wheel.

Mr Tanger's detailed instructions are too long to pubush here, but will be sent to any

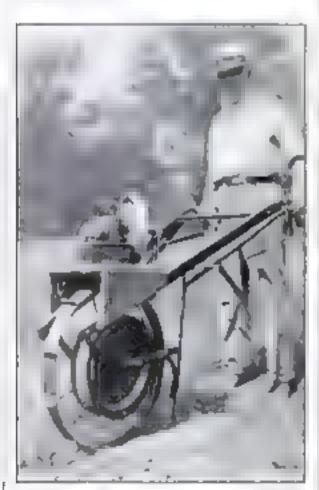


No work to make this tractor—a multicycle with two braits drume used as seen wheels

reader who includes a sub-audressed, stamped environe and 10 cents to cover the cost of printing. Ask for burietin No. 19

Many of the ractors entered in the contest were et a smallar general, spe. Some however were much heaver and more power a pag several a en and scats for the operator. Others were fighter and simpler lesigns. Starling and Herbert Cabilitar example, 4-1 an on motorsycle as replacing the rear which with two where made from all note brake or the secondary.

from oklauto brake crums as a parater. Another design of strone some est is that shown be as for which he M. Hawas was a venture soft hand a second hand washing machine motor as ne of in case some readers wish to build a light simple tractor of this type. Me claves not readers are given in H. with N. 20, which will be sent to any ne who incloses a set a stress of, stamped envelope and 20 cents to cover the cost.



Mr. Hawes' tractor made from a \$2.75 hand out I water and an old washing-stachast music

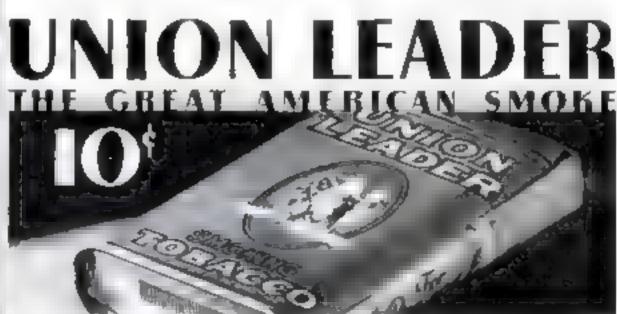


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A TOBACCO that won't bite any man's tongue. THAT'S NEWS! But that's only the ball of it. The mellowest Kentucky Burley you ever tasted. Matured and aged to the peak of smoking perfection. And a man's sized tin of it

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Of course, Union Leader quality isn't news to the millions now enjoying it. But to the smoker who has never tried it... the first pipeload or like a front page sensation. (Fine for cigarettes, too.)



# To STOP LEAKS of water,

Do THIS with and you save at least \$1.00 to \$10.00 over what a repair man charges for labor alone With cracked boiler, fire not or radiator sections etc., you also avoid the espense for new parts.

Smooth-Op No. 1 judicious y applied at cracks, leaky seams, pipe threads and flanges, seals strom, water mis, off, pr smoke leaks quickly and permanent y

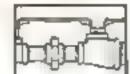
Householders find hundreus of uses, such as making stripped screws, boits and nuts boid, ightening loose hooks. iecks, hinges, bath zoom fixtures, handles, casters, mending leaky pots, pans. slove ovens, etc. Faceltent for stopping leaks in sulo radiatori, cracked water Jackets, seams in loose hub caps, exhaust pine and heater connections, lamp and tire braces, etc. A Smooth-On repair holds on any metal and is proof ngoinst pressure, heat and Albration

Smooth-On costs only and so special tools or skill are required. Merein father exects on inour free book I sman-Min of the Smooth On in metalliana will do the

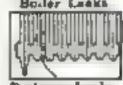
POWE - Auro

SMOOTH-ON

REPAIRS



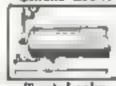




Rudiator Leaks

Fire Pot Leaks





Tank Leaks



Keep a can of Smooth-On No. 1 handy for emer-

#### FREE BOOKLET

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# 34

#### OUR SHIP MODEL and FURNITURE

## Construction Kits

will save your time

CHOLLD you intend to build our model or Admiral Farragut's flagship Hartford you can save yourse much time by making use of the construction kit marked L in the list below. It contains all the raw materials except paints. A model as large and complete as this requires a great variety of materials, many of which are difficult to obtain in small quantities. If you buy them separately, you usually have to take for more than you can use and are charged ac-

cordinely. Kit LL contains the same materials as I but he hulf pieces, or "lifts" as they are called, are sawed to shape, ready for glung

All kits are accompanied by instructions or blueprints. The continues on the following page

A. Whaling Ship model Il an derer. All the raw materials to gether with Blueprints Nos. 151 to 154 and booklet. The hull is 2015 in long...... 86.90

AA. Same with half lifts sawed .. 7.40 D. Spanish galleon ship model, 24 in long. All the raw materials (except paints), Brueprints Nos. 46 and 47, and a booklet. 0.45

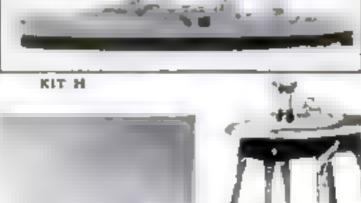
DD. Same with hall blocks shaped , 6.95

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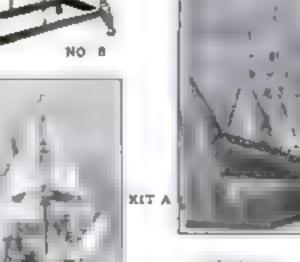


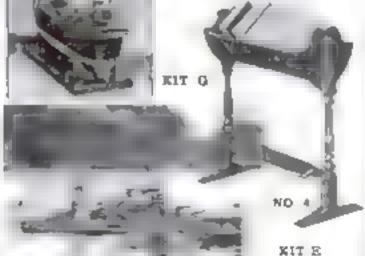


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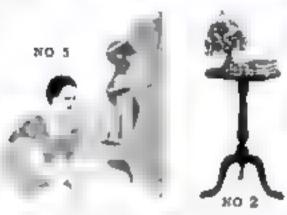


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EE. Same with bull hits sawed... 745 F. Liner Manhattan, All raw materials (racept points) for a simplified miniature model 12 in long and Blueprist No. 204-1 00

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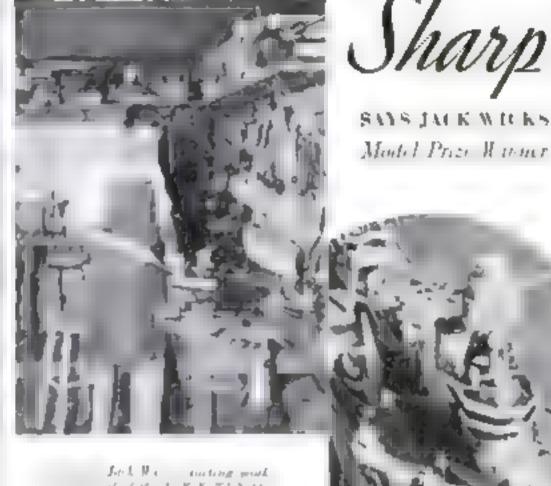
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# Armchair Desk

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ful and practical, for it enables one to write, draw, study, or play solitare white sitting is a comic stable upholstered chair instead of bending over a desk or table. The top can be tilted toward the mer when desirable it consults of a frame with a thin physical top covered with suitable cloth and trimmed with a painted, varnished, or enameled mold be

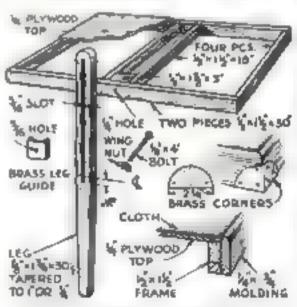
The frame requires two pieces ½ by 1%, by 30 in., four pieces of the same stock 15 in long, and a block 1% by 1% by 3 in A ½ in hole is bored through one edge of the frame and through the block to take a 4 by ¾ in carriane bolt, inserted from the reae and fitted with a wine not in the frost Cover the frame with ¼-is, ply wood, glord and bradded on. This the edges flosh after drying are slightly round them so the cloth cover will not be cut by them after being stretched. The moldant is ¾ is, or \$ 10 in, thick and 14, in wife. Two pieces about 1 to long are required.

The leg s of 1 1, by 30 2 its, pounded off at the top as shown and tapezed from the cult width at the center to about 1 or 1/4 in 21 the bottom. Cut a 5 to in, wide slot through it as indicated, this should be started from a point about \$5 in, from the top of the leg and should extend to point about \$6 in, below the center

Cut two 214 in, dismeter circles out of thin brass, then cut them in two to form four ball circles. Drill six small holes in each half circle as shown to take small brass escutcheon pro-

in long. Polish and bend these pieces along the dotted line. This provides four mexpensive brass curners to be put on over the wood molding. If preferred, you can buy suitable brass curner pieces. A guide for the leg is now made from a piece of heavy brase about 1 15 in. thick, 1% or 1% in. wide, and 2% in. long Drill a 3 tom hole in the chart center Put the plate in the vise and bend down each end so that the piece will fit loosely over the set. As the leg is 134 in. wide and most side easily in the brase guide, it is well to allow about %-in. play, especially as the paint increases the width of the leg somewhat. Polish the brass with steel wool, scouring powder, or metal polish.

Now select statable material for the coversuch as the kiral ordinarily used for card table covers. A piece not less than 22 by 32 in, is required, but as the material usually comes to in, wide it is well to get two-thirds of a vard because it is easier to stretch and tack it



Construction of frame, leg and brase fit-

OF THE PARTY

and afterwards cut off the excess material. The color of the cloth will determine the color of enamel to use for the trim. If black cluth is used, paint the trim a brilliant red or gold. If the cloth is orched, use nile green for the trim. If the fabric is light blue, use dark blue or rose trim. First paint the noderneath side and edges of the table. The top need not be painted as it is to be covered with the cloth

Also paint the wood molding strips and the leg. After all are hard and dry, stretch the cloth over the top tightly and smoothly, tackng glong the sides. Space the tacks, which should be small, about 1 in. apart so the material will stay taut

If a soft top is desired, a layer of cotton batting or a purce of soft heavy felt paper can he cut to size and laid on top before the cloth rover is fastened. If the cloth cover is put on directly over the wood top, a hard surface suitable for writing is provided. For a table to be much used for playing solitaire, the softer top is more desirable.

Next carefully measure and cut the four already painted molding stripe to fit over the edges and cover the tacks. The corners should is mitered. Nail the motding in place with brass escutcheon pins, but do not put any ualls so pear corners that they will interfere with the application of the brass corners,

which are next nailed on.

Insert a long nail or bradawl from the rear through the hole in the block to locate the center of the hole in the moking true Drill ng from the front, complete the 14-m. bale brough the molding into the block. Insert he carriage bolt from the rear and drive it home, taking care to avoid splitting or marring. the mokling. Now place the slot of the legover the bolt, insert the brass guide piece, and screw on the wing but

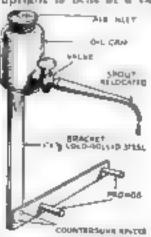
The leg can be turned so as to be paralel to the edge of the table, out of way, when the table is not in use .- W S. Gagosi

#### OIL DRIP ON LATHE FOLLOWS UP TOOL

A CUTTING-OIL drip that can be attached instantly to , he lathe and will formy the tool in thread cutting may ar made of 1 by in, cold-rolled steel a pint size offer, and a basin, brass valve

The foot of the "I" that forms the bracket is fitted wash two prongs or study spaced to enter the holes provided at the rear of the authorar-

riage for holding a taper attachment. These stude are not threaded. The upright of the "L" is of sufficient height to bring the oiler spout above the surface of any piece that will normally be turned. The upper end of the apright is bent at a right annie, and to it .



The arrachment may be removed as a unit



Adjusting oil drip for shouldering jab

riveted a disk on which the can rests and sweets. This disk should fit ast enside the bottom flange of the can The nil-can spout is removed and relecated as indicated. and the hole left in the filler cap is covered with a disk in the center of which a small air inlet is provided. When not in use, the attachment is removed.-1, D. RITTEARIES.

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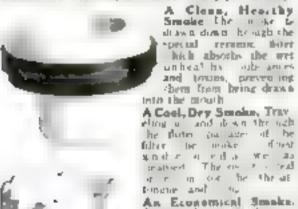
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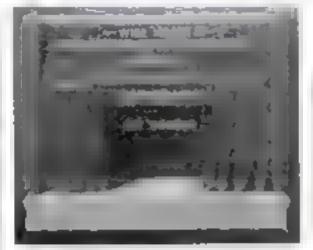
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#### CURTAINS AND SCENERY FOR MINIATURE STAGE

Lontinued from page 73)



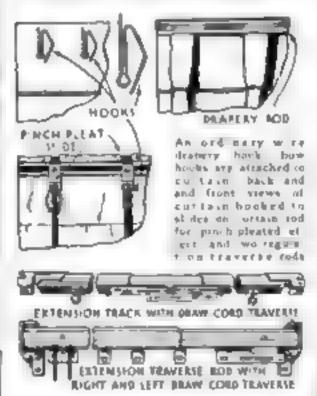
Stage with its front taken off to show how the cultures are bung by means of wise books

It will take two pieces of fabric each 15 by 22 in, to cover the frames, one for each side of the stage. They stand between the grand drapery and the main draw curtain.

The main araw curtain, ake the front curtain, is made of myon or silk and must have a traverse rod for case in opening and closing The drawings give details for hanging cur ainon traverse rock. This curtain is hung behind the grand drapery, leaving enough room for the termentors to stand between

Wood borders or set borders are made o window shade material or sign cloth atal are bung from wood batters in the same manner as the valance. The hottom edge of the wood border may be cut out to represent leaves and branches of trees above the stage. These are painted with show-card colors to match the wood drink

The wood drops are made of the same material as the wood border and are 18 by 50 in. They have double wood hattens at both



top and bottom Point any scene desired with show-card colors, taking care not to go into too much detail.

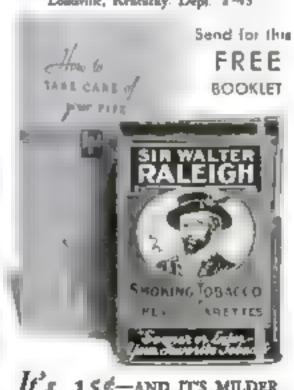
Wings are used on each side of the stage to mask the sides. They should match the back drop and burders. Use two pieces of wall board or pressed wood composition board cut 6 by 18 in, for each set of wings. A strip of heavy cloth tape 2 in, wide and 18 in, long is gived on to make a himte as shown. Cover the entire surface with shade material or sign cloth, and apply a size of thin glue. Paint to match other pieces of the same setting

Many of the new (Continued on page 69,

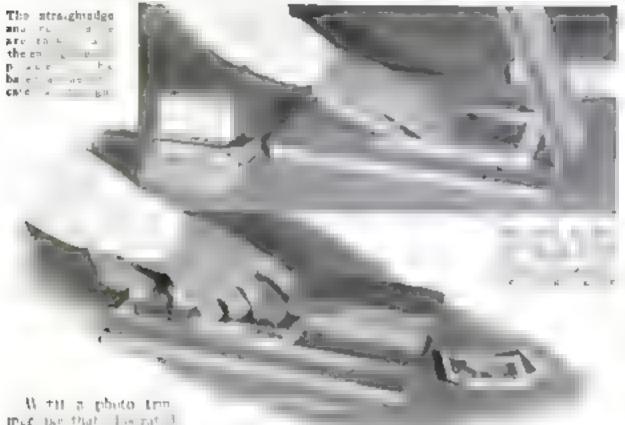


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found where a rator blade is used for the cutter can be avercome, such as the difficulty of cutting a perfectly straight line or the danger of breaking the blade and cutting one's fingers. Not only can it be used for trimming enlargements or printing marks, but it is also easily adapted for cut ing cloth or art leather

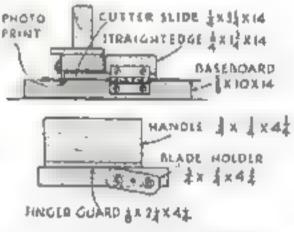
The cutter slide, 1/4 by 31/4 by 14 inplywood, is nailed securely to the straightedge guide, which is 35 by 135 by 14 in and both are hinged to the baseboard—in this case a bread board that happened to be 35 by 10 by 14 in

The device for holding the rator blade at constructed of three wooden pieces—a blade holder 1/4 by 11/4 by 11/4 in a finger guard of cigar-box wood 3/4 by 2 by 11/4 in., and a handle 3/4 by 11/4 by 11/4 in. All three pieces are nailed to-

gether as shown. The casor blade is fastened at an angle to the holder with two small wood screws. It should project beyond the edge of the finger guard about 1/2 in., making it possible to sight down the blade for accurate cutting

The blade bolder is placed on the slide against the straightedge guide and slid from the hinge end to the bottom several times until the razor-biade corner cuts a groove about 1 16 in deep in the base-board, which helps to keep the blade cutting in a straight line when in use.

The photograph to be trimmed is laid under the slide and firmly held there by pressing down on the slide while the cutter is being drawn along it. Liming the baseboard off in 1/2-in, squares makes it a simple matter to square up the photograms—R. MERT L. Williams



An end wave of the complete trammer and a neds when of the plating super-bands holder



#### REPAIRING A T-SQUARE

T-BOUARES often get broken at the ends, and the cedatoid edges spread. A surpre way to make a permanent repair is as follows. Coat the broken edges with caseen glue and wind the bit de tights enough with heavy string to draw the parts ingether edgewise. Then apply a hand acrew or C-clamps to the faces.

After a few hours remove the clamps and string, and scrape the joint smooth. If the edges need jointing take the blade off the head, clamp a plane in a vise, bottom up, and draw the celluloid edges over the cutter. Finish by rubbing the edges over fine sandpaper.—E.M.L.

#### HOW TO CUT OILSTONES

A CRACKED or broken oilstone can often be salvaged by cutting it off and making it into a smaller stone. This can be done by using an ordinary hack-saw biade set backwards in a frame so that the smooth edge does the cutting. A of the kerosene or turpentine seems to help the cutting action.—A C Darry

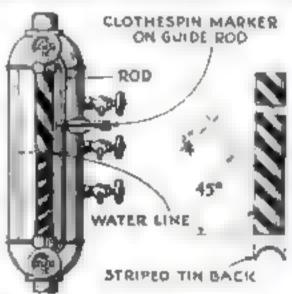
98

#### WATER INDICATOR FOR STEAM BOILER

THE water fevel in the gage of a steam boder is often rother hard to see since both the glass and the water are transparent. A simple way to make the water level clearly visible is to paint alternate black and white strapes 3/4 in, wide, across a paece of tun at ah angle of 45 deg. and bend the tin in a semicircle so that it fits closely against the back of the water-col umn tube

When viewed through the tube, the stripes that are seen through the air filled space seem to straighten up at an angle much greater than 45 deg., while the stripes seen through the water become more nearly borizontal. This makes it easy to see the exact level of the water at a giance. The effect is caused, of course by the difference in diffraction between the air-filled and water-filled portions of the tube.

A purch-type clothespin pointed white with a black indicating arrow on it may be clamped on a rod adjacent to the water glass to serve as a convenient marker for judging the rising or falling of the water—Norman V Daymson



A riece of the with black attribet is set be-

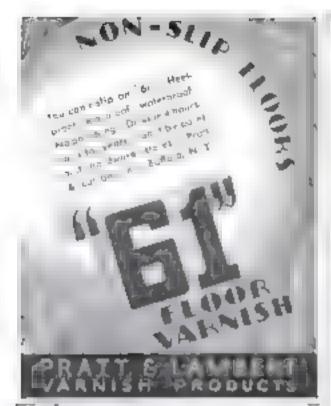


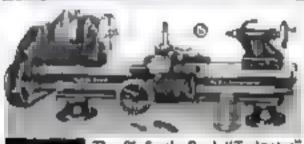
#### CLEANING PAINTBRUSHES

A 4-1%, wire brush on a power-driven flexible shaft will remove deled point from pointbrushes without damaging the ferrules or bristies. Even though the point



has dried for several mon he I have found it possible to remove every trace. The easiest way is to lay the pointbrush on a flat surface and move the wire brush, turning about 1.73 a.p. M.—W. McCrate.





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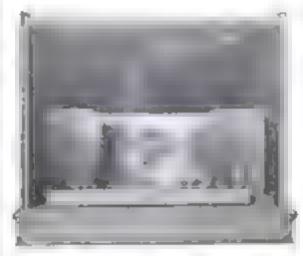
(Agunussa)

Always mention Popular Science MONTHLY when answering advertisoments in this magazine.

#### CURTAINS AND SCENERY FOR MINIATURE STAGE

(Continued from page 57)

plays are using modern settings with a black curtain at the back and sides. This curtain is known as the cyclorama or "cyc." To make a "eye," duvety ne. monk's cloth, rayon, or ve-lour in any color may be used. The two side walls are 18 in high and 15 in deep, and the back wall is 15 m. bigh by 30 in, wide As a rule altow about 50 percent fullness its all cur-



Open stage with wood drop in the back, two wood wings not in place, and border lights

tains, It is well to run a chain weight through the bottom bem of a curtain to make it hang straight. Run a regular rod that has been best to the desired shape through the top hem and hang it in place in the stage. One border 10 an. wide and 36 in, long will be sufficient

In an article to follow, Mr Bicks will tell how to make the electrical equipment

#### Winners of Indoor Photo Contest

PRIZES have been awarded as follows in the first of our winlet series of indoor photo contests (P.5 M., Nov. '53, p. 68)

FIRST PRIZE, 825 L. DeS. Dibert, Philadelphia, Pa.

SECOND PRIZE 815

O. A. Garmendia, New York, N. Y. THIRD PRIZE, 85

M. Margorskan, Berkeley, Calif.

FIVE PRIZES, \$1 each

N Desmond Taylor, Chicago, Ill; H J. Grefith, Pallet Texas, Charles J. Relden, Pitchfork II ye A L Estep, Cicero, Ill , H R Van Loan, Auroton, Conn

HONORABLE MENTION I E Armstrong, Dotta Texas Lloyd J. Carturicht, Sagnau Mah Doud J Gold tein, Luca V 1, A O Huntergron, Harrison, Me R D her kner, Philadelphia, Pa Mrs. Guy M. Poge, Builington, Vt. Oin B. Powers, Union, Mo , Levels B Simon, Combridge, Mass.; Oscar Welauder, Roslyn, N. V. M. G. Westerkam, Baltimore, Md. W. Ed-gard White Plymouth, N. H. and R K Wood, Chastanooga, Tenu.

Winners of the December contest will be announced next month



#### Replaces Wood with WOOD -The New Way to Make Home and Workshop Repairs

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Don't be without Plastic Wood another day. Buy a 25c tube or 35c can at any hardware, paint or department store today. Fix up the things that need fixing and then keep Plastic Wood handy for future repairs.



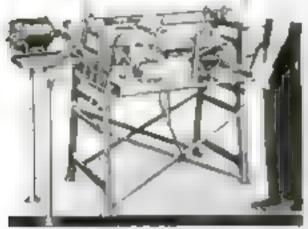


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#### Now is the Time to Start

The time to get started is NOW It and a bit too ear's in so car lawnmower sharpening but ness dend couper or post



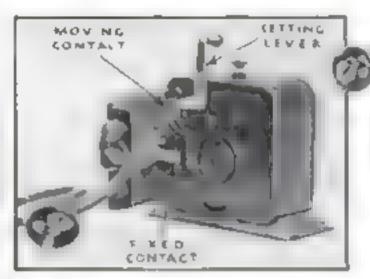
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### Alarm-Clock Time Switch

turns on heat in morning By J. L. BIRD



FTFR the beat-control equipment described last month (P. S. M., Feb. '34, p. 74) has been installed and operated for a short time he bunder will undoubt dy wish to aur a device that will automatically cause the tarraic draft to be opened at a presented n new carl hour in the meeting This will enable him to maintain a lower

night temperature and still have the rooms warm when he arises in the murotus. Such a device Beels an ask thomal fuel saving The construction of this extra equipment is communities to simple and require to ala strong to the examp heat control system. becomes electrically or an inexpensive alarm

a rela a malar to the one already uses, th the control system.

tosome that the night temperature has been set to 65 den F with the thermostat This temperature will be maintained throughout the night until the predetermined time set on the ararm clock is reached. At this

jock little I with a simple contact device and

point the platm test of the clock will close an electrical contact and cause the auxiliary relay to be energized The relay takes control away from the thermostat and at the same time completes a circult causing the motor unit to open the furnace droft. This action will open up the fee to provide a comportably warm room by the time the builder is ready to get up When the auxiliary relay coll circuit is de-energized, control will then be automatically restored to the ther mostat, which now can be adjusted for the day temperature

The slarm clock may be of the dol he type. Select one that has right wings on the winding keys. Wind up the alarm spring until it is almost fully wound. Now lasten to the about 11/2 in, long. Mount on an insulated block a fixed contact and lasten this to the clock case in a post tion where the moving contact at tached to the whereas her will strike it when the alarm is set off and the key unwinds. When this occurs and the contacts close further anwinding of the alarm sprine is prevented

Ope photograph shows the back of an alarm clock fitted with such a contact arrangement (if whi he noted) that there is also a rotary switch on The front and back views of an alarm clock firsed with a contact device for use in a heat con-ro' system. I enseg see a relay at a predetermined hour

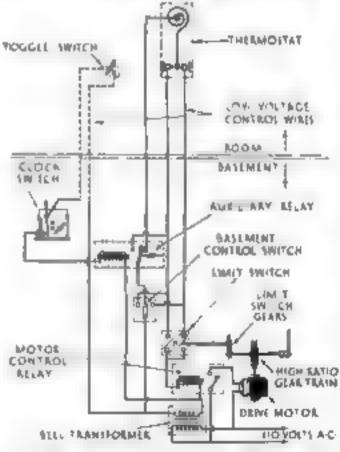
the clock out this is for another application and may be ignored) It is suggested that the builder fit the marm winding key with a short lever that projects above the case. as shown. This was serve as an easy method to reser the moving contact and at the same time would the marm

spring Connect one ware to the maximum contact and the other to the fixed contact mounted on the insulated block wires are the connections to the auxiliars

reals coil circuit

The relay may be a discructed in a manper similar to the one med with the regular The contact priange heat control evalers. mont, however, should provide a nemant closed circuit when the relay is and energized and make another circuit when the relay in checkions The as to an motion who me by acking to the relay base a contact post that will t uch the in our contact on the react attracture when it is open. The spring on the armature which serves to keep t noon is a less previde the necessary contact pressure or this back conta the normally The relax coil e tage should chosed one be the same as the one used with the original control system.

This auxiliary relay may be mounted in any convenient location, near or on the motor drive and. The woring diagram shows



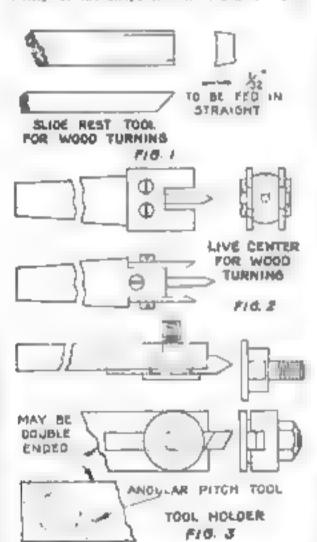
Wirned diagram of bear control one oment with a clock switch to open draft early to the morning how all the connections should be arranged for both the contacts and the coil circuit.

An extra convenience for easy control of the cock action may be had by running a pair of wires up to the thermostal location These should terminate in a small togeth switch. Illustrations in the previous assue show this switch mounted in the bottom of the thermostal case. This switch is connected in series with the auxiliary relay coll circuit. After the clock contact has energited the relay coil to take control away from the thermostat at the desired early hour, it can be regained later in the morning by snapping his switch to the "off" position. It is not necessary to go to the basement to open the clock contact. However, thu extra feature is just a convenience and by no means essential for the operation of the clock control. The circuit for this feature is shown dotted in the winning diagrams.

A time-switch system such as has just been described will enable the builder to save considerable fuel by maintaining a fairly low night temperature, yet the house will be warm when he arises in the morang

#### SPECIAL TURNING TOOLS SIMPLIFY LATHE WORK

FOR parallel cutting or the fashioning of a drep shoulder in soft, coarse grained woods, few tools can equal the cutting efficiency of the shape shown in Fig. 1. The



A scraping tool built-up live conver for wood turning and be der for thread-cutting tools.

two corners enter slightly beyond the cutting edge of the scraper and tend to break up the chips as they are formed

In general use, the live center illustrated in Fig. 2 has few rivals. When used in split turning, the driving blades tend to hold the meces together

A tool builder for use in cases where breads are to be rut with two or three tools is illustrated in Fig. 3. The various tools can be taken out and replaced without any adjustment to the tool bolder. The holder can also be made double ended for use with tools having an argular patch.—Greater P. Salair

#### MAKING EXPERIMENTS WITH "BLACK LIGHT"

(Continued from page 65)

screen wire. The frame can be attached to the lamp support or provided with legs so that it can be set any where

Even without buying a piece of ultraviolet glass, you can experiment with black light at a cost of about 50 cents for one of the new 'watt glow lamps tilled with argon gas. This is sundar to the familiar spbt-disk type of neon glow lamp except that it produces a visibly blue Right. It is each in near ultraviolet light in the region from 3,500 to 3,800 Augstrom units. of wave length. It will operate on direct or alternating current at 110 volts. Since it is not a very strong source of ultraviolet light at must he used close to the objects, ordinarily within a few inches. (For advanced work in laboratories and museums, very powerful duorescent lamps are available. These are Cooper Hewatt lamps equipped with a mercury vapor are to a tube of makel cobalt glass t

THE small areon glow lamp is intended for use chiefly is producing duorescence—that is, may no other substances glow with we the beht. A par of vascine placed near it will give off a ghostly glow. If brightly colored sitk handkerchiefs are bekt near the tamp, some of the dyes will glow with wrird, firelike colors. Some forms of a assistad and buttom flagresce vigorously in its light.

The action of altraviolet light on minerals is so interesting that one company has prepared a collection of ten mineral specimens that give of bight of various hues when exposed to the invisible rays, and is offering these, together with an argon glow lamp, at less than five dollars. You can pick up pieces of rack almost anywhere that will react to ultraviolet light

The faces of your friends, seen in ultraviolet light, will take on a startling appearance. One of the first things van will notice is that the teeth are fluorescing. Finger made react like the teeth, but with less bedhancy.

If you are fond of amateur theatricals, you can introduce variety into performances by using the luminous paint and ultraviolet colors sold for this purpose on parts of the contumes, props, and scenery. When ultraviolet light from one or more properly screened sun larges or photofood larges is directed on the otherwise darkened stage, the paint examp visible light, even at a distance of several feet from the light source.

If you are an amateur photographer you can photograph various articles in the light from an ultraviolet lamp. The use of black baht for detecting forgeness and other alterations of written documents, with the aid of the camera, is well known (see P. S. M., Oct 31, p. 36, and Dec. 32, p. 75)

The region of ultraviolet light in divided by scientists into three parts. It is the so-called 'near" ultraviolet that passes through glass, makes possible the taking of photographs, and causes must of the duorescent effects described. "Middle" ultraviolet is not transmilted by ordinary glass, but does pass through the special bulbs of various lamps such as the 5-1 and 5-2 sun lamps, the G-1 and G-5 glow lamps, and the CX lamps used in poultry work. This is the ultraviolet which creates vitamin D and is beneficial to bealth. short wave ultraviolet region requires quartz for its transmission, kills germs and is injurious to unprojected eyes. Such short-wave radiation comes from quarta-mercury are lamps such as you find in doctors' offices, from carbon ares, and similar sources.

However, in your ultraviolet experiments with photoflood, S-1, areon, or similar lamps, you need have no fear of injoring your eyes if you do not look directly at the unshalded lamp (excepting the areon bulb, which causes no local).

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#### DECK FITTINGS FOR HARTFORD MODEL

(Continued from page 71)

already made the cable bitts. The bower (unchor) cables lead down tham pipes alongside the second hatch, and the stream anchor cables down similar pipes by the batch abait the capstant. These will be sections of tube large enough to take the cables. Along the deck are checks marked Z to keep the cables off the deck, they are merely square blocks with a groove on con to take the chain. Lp to the lorward pipes the chocks are double

File rails are needed around the foremast and mainmast These can be cut to shape (see Ti and To on the deck plan? from a piece of hardwood or fiber board. They are each supported on three turners stanchions. The outside stanchions each have two holes bared fore-and-aft to represent the sheaves for the topsail sheets and topping lifts. The tails will have about eight be-



The double streeting wheel with the two binnecles, the faut of the intransment and a batch with crossed wires

BULLY. AFTER. HEAD ) W INN ION HATCH -HATCH COAMING BERTH DECK FORWARD COMPANION HATCH BULKHEAD BERTH DECK GLUE AND MAIL -

Two of the hotches can be tell open, if dosized, to show a fragment of the berth deck

las ng puts in each. At the mirgenmast it is slightly different since there are only the topsail sheet bitts and no rail (see F4)

There are two steering wheels separated by the drum on a shaft. They are supported by iron brackets outside the wheels. The wheels, made as neatly as possible, should be about by in in diameter. The whole assembly is built and the ends of the supporting standands nailed to the deck. If a piece of small chara is wound a couple of times around the drum and the ends run through holes in the deck, it will give a realistic appearance,

The lumna are marked & are countly The oral rals are multiogany, with diding doors on the after side to discluse the compasses within. They stand on turned brass standards and have bress lamps let into the tops.

There are four ladders P. a central one to the forecastle head, one on each side to the sup, and one to the gangway platform This platform X is a square grating, supported on a batten on the bulwark and two stanchous, which extend up as shown in a sketch last month. Through the stanchiona rope from the gungway beard is rove and extended to another stanch in a he said of the ladder. As these platforms are in the way of working the guns, I presumed there would only be one, which could be shifted across the deck if required

Up in the bows, in line with the inside of the sides of the stem, are the knightheads BB, 36 in square and 1/2 in high On them is litted a short plantil to take six helpy no pens for the 1th outhauls and downhauls. On the after end of the forecastle I showed the ringbolts, three on a side, and just abaft them the fair-leads for the lib shrets.

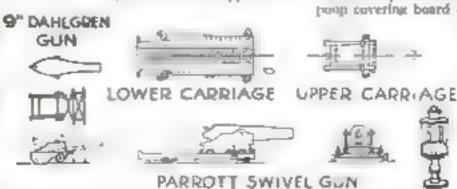
On each side of the forecastle and poop will stand a pair of wooden mooring bits & They are a full 16 in thick with crossbars half of that, butf-lapped in.

Firmly fastened to the main rail on the inside are five sections of pinrail, each side, as shown on the deck plan. They are just hardwood pieces drilled to take the belay ing pim, which may be inserted now or later It looks best to put pins in all the holes, but only part of them will be used as we have no sail gear rove. On the poop there are similar calls, but supported on turged etanchions.

Mooring line fair leads or thocks are let into the cap rail forward and placed on the posp covering board below

> Around forecastle and poor there will be protection rady of an no ball stan chiefs with thin wires run through. The dots on the deck plan show the approximate position of these. The holes may well be drilled naw, but the Stanchions are better

Contented on page 93.



The Dakigren gens are 1 5 [6 in long, the Patrott gress I II In long, with carriages in proportion. The binnacles are 9. 16 in. high

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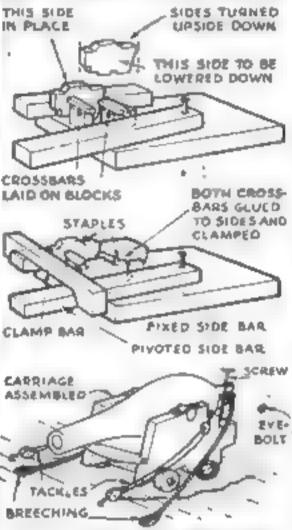
#### DECK FITTINGS FOR HARTFORD MODEL

(Continued from page 92)

left until the finish with the exception of the short sections on the fore aide of the poop the top wire of which I extended down to stanchions at the foot of the ladders. I found No. 34 were best for recying through the stanchrons.

Though it hangs on the mainmast, the bell is part of the deck fittings. It is about 1/2 in, high and the same across the mouth. It hanes from a bracket fixed to the mast so that the tongue is 1/4 in, from the deck

During the Civil Was period, the Hartford carried twenty two 9-in. Dahlgren guns The lines for them shown are taken from a contemporary naval instruction book. They are best cast or turned from bronze and modured The carriages are quite tedious to assemble so I made a jig as shown for gluing them together It should be oiled to prevent the



One of the Dahlgren guns completely feted, and, above, a fig for gluing the carriages

parts sticking to it. Before removing each carriage, drive in the two staples for the wheel axis. Put in two more staples on the af er ster for the tackies. Lay the cun trunmons in their nutches, then cut thin stries of prass wild to shape, dott holes in each end, and use pinheads to nail he guny in position. Next make the whiels, bored to fit ught y on the asles, and glue in position Note that there are only two-wheels. These guits were not raised with wedges, but by a screw with a crossbar through the end and working in a ring at the breech, to one side I threaded some No. 20 hard bram wire and soldered little prossbars to the ends, but instead of finishing it at the crossbar of the tatriage, I bored through that and drove it into the deck. Which looks the same but holds the gun in position, with the aid of a touch of glue under the carriage. I then put a touch of liquid solder where the screw touches the breech

To take the recoil, these guns have rope breezhines, which have to be long enough to allow the muzzle to jump back clear of the bulwark. I spheed (Continued on some as)

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#### DECK FITTINGS FOR HARTFORD MODEL

Continue d from page 43

eyes in the ends of the breeching and seured them to loose evenolts. Next I took a half turn on each side, which I kept in shape with a turn of thread, then slipped the middle in the slot in the cascabel, and pressed the eycholts into the holes bored in the bul-Warks

The grans also require tackles on each pide-These conest of two single blocks from the carriage to bolts in the bulwarks. One bolt is driven centrally between each pair of guns for this purpose. I found it best to strap these a sain, blocks with wire, forming a hoos. The lackles are rove, the blocks hooked and hauled tight, and the ends batched around all parts

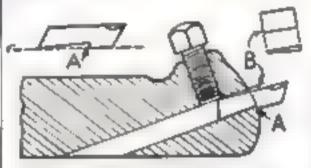
There are also two larger Parcott swivel guns. The carriage proper for these slides on another long carriage to which they can be riamped with screws at the sides. The lower carriage has swivel wheels so that it can be moved to point in any direction on the tracks shown on the deck plan. I made these Bracks of areboard pareted black and glued down. The lower carriages should have at least two tackles on a side to ringbolts in the deck but had better a se be na led lown

There should be a singlish as nearly minships as possible back of each gun for the inboard-hapl tackies, which need not, however, be tove. Guns and carriages are all black, and tackle blocks brown or black

(To By CONTINUED)

#### USING SHORT TOOL BITS IN STANDARD HOLDER

ABOUT I in of every ordinary \$/16-inclamped securely with the set screw of the usual type of holder when it has been ground shorter than thu. To reduce this loss material ly, grand either by hand or on a surface



Merhod of patching a short lathe tool hit atthat it can be wedged in an ordinary bolder

grinder a step in the bottom of the decarded bits as shown at A When put into the horder, the bit them cannot be forced back by the cut tarther than the end of the step which strikes the hottom lip of the hole This, however waves an opening at the top that is wide in front and tapers toward the back

A discarded power back saw blade is now broken of at one end and ground into a wedge about 1/2 in long and 5/16 in, wide as shown at B It is then nicked with the wheet and broken off. Some care should be used in making this so that it can be used with many other bits. This woder is foven n tight on top of the bit with the side that has been ground facing it. The will hold the bit more secure than when clamped with the screw is a the lat may be read v removed by driving it out with a punch on the inner end.—Gronce J Memocs.

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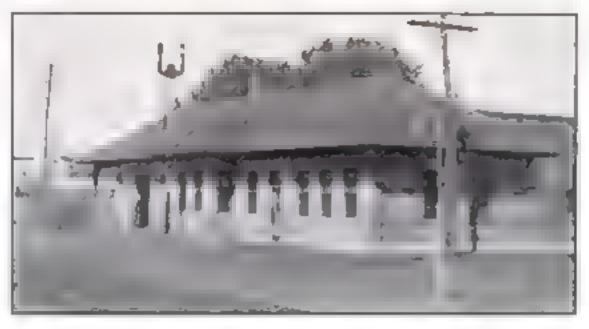
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### Up-to-Date Station

#### Improves Model Railway System

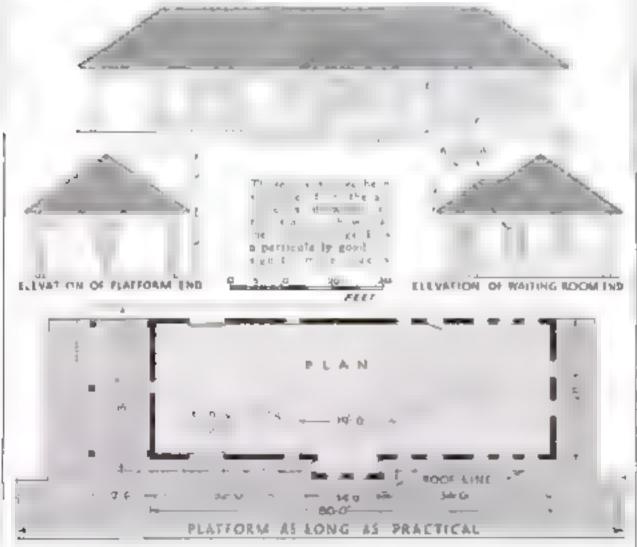
By J. W. CLEMENT

rancoad by a service equipment and station facution. For this reason every model radway system should have an up to-cate station, not chaocrate and not too plain. Plans for a combination passenger and freight depot are given below. They show brick construction. Some of the tresone labor of making imitation brick may be eliminated by building of states, taking course sandpaper painted gray or tan. In either that the cost should be a tile red with win

labor of making imitation brick may be eliminated by building of stucco, using course sandpaper pointed gray or tan. In either case the root should be a tile red with win dow frames and sash, door frames, and postaunter the covered past orm painted dark gray with light gray panels. The wheel guardent the freight door frames are painted black. The station agen, if any, hould have a black background and white letters.

For a brick or stucro depot we can furdly escape making a brick platform. This should not be too difficult, however, if a reddish tan I noteum is used and the bricks are outlined with ink. The outer edge should be painted gray to represent the concrete turb. Let the platform be as long as practical.

Use your own good judgment as to materials, but slick to the plans so that your depot will be correctly proportioned. The star you make it will depend, of course, upon the scale of your model railway. The scale given with the drawings represents feet, and with it you can fine the actual size of any part of the depot. If, for example, you wish to build the wation on the scale of a chequals I ft., then each of the small divisions at the left end of the scale should be taken as 1/4 in. in building your model



# "WHEN YOU QUIT MAKING EDGEWORTH I'LL QUIT SMOKING"

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> 1527 Appa Street San Francisco, Calif. June 7, 1933

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Listening tonight to your program I left that I stend it to your clob to report my appropriates at an Edgeworth amples.

Three years ago white no a whit to Europe I had some unusual experiences. Heven different a must be fixed different countries I mas asked by total a rangers, " You re an American, are you not?" and in each case I countries how I foll when in each once I found that they had identified his by Edgeworth smoking tobacca.

Riding on a train in France on Englishman after watching me for some I me spoke up as follows: "Parsion me, but I can't resist any longer saking you for a pipeful of that beautiful toleron. Engeworth ! In I know, and fude as at may seem, I am just dying for a smoke of it."

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bacco. It is on the air every Wednesday evening at ten o'clock, Eastern time, over the WEAF Coast to Coast network of the National Broadcasting Company. You are invited to tune in and join the group of country people having a big time at the old Cross Roads hall down in Virginia.

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#### THE NATIONAL HOMEWORKSHOP GUILD

(Continued from page 67)

larger cities. The larger the club, the more varied will be the hubbles represented. This increases the interest of the club as a whole and also provides manifold topics for discuseion, demonstration, and club projects

Inquiry. Are groups of boys aged 16 and 17 too young to form an affiliate club? Austres: No. The minimum age is to.

Inquiry: Does the Guild intend to create a committee or department for various types of homecraft work? Austrer: No. craftwork sponsored by the Guild embraces all the brunches, and the Guild does not intend to specialize in any one branch.

Inquiry: Does the territory of the Guild extend into Canada? August: The National Guild will accept affiliated clubs from Canada

Juguiry: I am 14 years old. Can a group of my friends of about the same age form a junior club, as they are all much interested in homecraft work? Autore? The Guild has not yet empleted arrangements for the formation of jumor clubs. It is suggested that you and your friends endeavor to intreest older members of your families in the formation of a club. They, in turn, could then organize a junior home workshop dt vision of that club

The local clubs already fully organized at the time this is being written, and their officers, age to follows

Amazillo Homeworkshop Clieb, Amazillo, Trus-Dr. W R. Moody, president, H B Vaucho, vice president, D. C. Regal, secre-

Imateurs Homeworkshop Club, Richmond, Va.-Floyd E. White, president, F W Har-rison, vice president, Forrest H. Stairs, secretarn freasurer

Circuland Homeworkshop Club, Cleveland, Onso-Thomas B. Owens, president, Parker Hyward, secretary, Thomas B. Graham,

Cody Homeworkshop Club, Cody, Wyomong-E. T Tricket, president, F J Worst, secretary; Stanley Langren, treasurer

Percer Homeworkshop Cub. Denver Colo.-A. D. White, president, George R. Welson, vice president; Leonard Stebbons, sect fary Irea-weer

Overa president, Carl H. Fisher, vice presi dent , E. W. Gerden, secretary-treasurer; H. H. Immert obrarian

Farfield Hobby Club, Faitfield, Ala .- J Duke Haney, president; Roy B McEachen, secretary; Herbert Burnett, treasurer

Flint Homeworkshop Club, Flint, Mich .-Bernard Schlegelmilch, president; Ivan Meade, secretary; Francis R. Voight, treas-

Glen Lyon Homeworkshop Clab, Glen Lyon, Pa.- John Domzalsky, pressiont Charles Cragle, secretary, Willard Hoffman,

National Homeworkshop Guild e o Popular Science Monthly 381 Fourth Avenue, New York, N. Y.

I the presented to the house was hope total IT MADE OF PARTY wighting a distall district or was end me this information in the local or widesed nod stamped encylope I am inclusing

Hemiock Homesepekshop Club, Sharpsburg, Pa.—Joseph A. Smith, president, Joseph B. Mahon, vice president, Joseph H. Mary, recretary, Raymond M. Lester,

Jaynesville Homeworkshop Cash, Jaynesville, Wisc.-Alan W. Dunwiddie, president, A. G. Weaver, necretary-treasurer

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Leatherstocking Homeworkshop Club, Cooperstown, N Y Myron E. Clapsaddle president, LeRoy L. Parshaft, secretary, F ( Shepard, Ireasurer

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Morristoten Hometeorkshap Ctub, Morristown, N. J .- E. A. Carpenter, president, K. C Bates, secretary-treasurer.

Rockford Homecraft Club, Rockford, Dl. -LeVern T Ryder, president, Wolliam Bauer, vice president, E. Raymond DeLong, secretary, R. A. Horner, treasurer

Silverion H imeworkship Club, Silvertan Colo.-D. E. Smith, preudent, E S. Davis, secretary; D. M. Wyman, treasurer

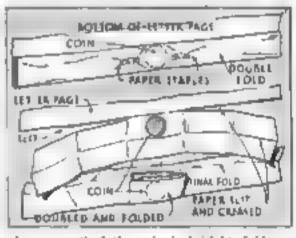
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I meland & raftsmen's Guild, Vineland N J-John W. Dennis, president, John S. Harker secretars, Bernin S. Howeven. treasurer.

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As the official magazine of the Gual-Post the Scherce M orning will report the organization of all new clubs and give a w. of their officers.

#### TWO SAFE WAYS TO FOLD A COIN IN A LETTER



In one method the goin in beid by folding and map ing , in the other, by folding alone

RECENTLY I hit upon a kink for sending small coins through the mail that is bet ter than any other method with which I have had experience. I fold the coin into the lower portion of the letterbead riself and, by means of an ordinary paper fastener, staple both sides so that the coin can't be taken out without tearing the paper. It becomes part of the letter. - W F. Schapholar

A somewhat similar method is shown in the second sketch. It has the advantage that no stapling machine, paste, or paper fasteaers are required .- The Emiron

#### MICROSCOPE ADVENTURE IN A FISH BOWL

(Continued from page 49)

cannot hope to see all of them, unless you spend the rest of your life in the study of nothing else

Perhaps the most beautiful scene that the aquarium offers is provided by the fish scale. Take, for example, a goadfish, preferably one recently dead. It, like many other fahes, has scales of the cycloid type. Scales from different parts of the body differ in appear ance. Those, for instance, from the lateraline-the line that rurs from head to tad along the ride of the body-are equipped with tunes through which it is believed some kind of secretion takes place. Scales from other areas have no tubes.

VCLOID scales generally are marked C with lines running shoul & common center, crossed by a few radiating ribs. The clear, uncolored portion of an individual scale is that part which was beneath another scale or scales. In the projecting portion, you can see the chromatophores, like those that made Pete so beautiful. These are conto ped to a membraneus covering that you can scrape off with a dissecting needle

Remove this covering from two or three scales and crush the mass thoroughly in a drop or two of water. You will see the water take on an tridescent, peacly appear ance. Remove the large solid particles and drop a cover glass over the water. Place the stide on the microscope stage and adjust the focus

Before your eyes, you can see one of the most interesting things in nature—the particles that produce the penally luster of a In the microscope field are hundreds o, them, dancing restlendy about, throwing the trot light every way like a mass of moving diamonds. Exam nation reveals that they are then, flat, transpacent plates. Moving restlessly, perhaps because of a slight ng ation of the water, they act like thry mirrors, each catching a my of light direct ing it momentarily up the microscope tube and then turning so that it becomes almost anvisible

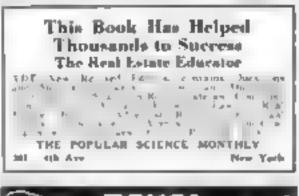
These plates or spicula or iridocytes, are seen best by reflected light, although they are visit le by transmitted light when a smallcondenser stop is used. A good way to IIluminate them is to place the microscope so that light from the sup or an electric bullfalls upon the microscope stage, and is not reflected upward by the mirror. A dark held fiture nator can be used if available

FISH-SCALE spicula are found in many fishes besides the one you are examining. They seem to be about the same size and shape, no matter what the size of the fish. As an stem of commerce, they are important. They are constituents of the fish state essence that is being used in automobile lacquers, toilet articles, glass beads, and elsewhere for oroducing a pearl-like appearance

But you have only begun to explore your aquarlum, Snods, placed to that they will hang from the bottom of a glass slide, and B'uminated from above, are entertaining. It is fun to watch their rasplike tongues scourthe glass for food. When the aquarium glass becomes covered with green algae, the snails travel over it, scraping off the vegetation. Their tongues are set with hundreds, even thousands of teeth. The pond small makes a good specimen to study because it is not too big to hatag suspended through the hole in the microscope stage. Its toothed longue operates like a sanding belt when it feeds.

The chances are that you will find patches of snall exes on the aquarium glass or plants. Scrape these off with a major blade and examune them at (Continued on page 98)









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#### MICROSCOPE ADVENTURE IN A FISH BOWL

(Lostenned from page 97)

various magnifications. Newly laid eggs eathbut promunent model. It is interesting to watch these spots change gradually, over a period of days, into tiny mask that crawl about inside the egg for a time before emerging into open water.

Daphnia, a water-flex related to the shrimp and lobster, is a common form of food for fish. You can get these little creatures from almost any fish dealer. Put one of them under your microscope and you will get the impression that you are gasting at an active piece of mathinery. One observer remarked that, "It's just like a printing piece."

THE water dea which normally darts about erratically is held in one position by the cover glass at the micro-a pair am you constructed for observing Pete the tropical fish. But it does not retain motionicss. The black eye that resembles a rog-wheel vibrates back and forth for no apparent reason. The digestive gland and forward end of the intestinal tract which serves as a stomach, pump constantly, churning the food and disestive juices. The tiny heart vibrates rapidly, circulating the almost coloriess blood. The swimming feet beat the water in an attempt to propel the body. If the fice is a female, the chances are that her brood pouch will contam six to ten young which, in turn, are kicking their feet and otherwise contributing to the action. The outer shell of the daphnia has an enteresting terrore

Vour exploration of the aquarium will include examination of the plant life there becape some of the green alian from the glass or larger punts put it upon a ship and examine it. You will find my rads it little green plants resembling jointed sticks clubs, and a host of other things. In this microscopic forest, you will see awesome creatures—the rotter steratour polymor phus, parametium, amoche, and dozens of other greatures, some of which have been described in previous articles of this series. The grant of the atgae longst is nais, a small worm related to the earthworm, and just barely visible to the naked exc.

Perhaps you will want to preserve some of these wonders for future reference. Fish scales, properly dried water-fleas, and other interesting specimens can be mounted easily. This brings us to the fascinating subject of slide making, and to a little time-saving device that will improve the quality of your suites.

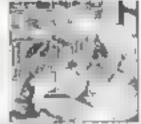
Cover glasses, temented in place with but sam, sometimes come loose and admit air bubbles before the balsam is dry, thus running the slide. This is particularly true when cells of shelfac or cettigod are used. By tamping the cover glass down against the tell or slide such troubles are avoided.

SROWN in the pictures is a clamp that will do the trick picely, and heavy to construct. It can be made in almost any sur, to accommodate any number of slides at one time. The device consola escentially of a wood block on which the elides test and a lastery of spring plungers arranged so that they will press against the cover gasses. Plungers in the model shown are empty film spools from a small camera. Of course, other types of spools can be used, or you can make little plungers out of hard wood.

Because the spools used have ends that are fastened turbity in place, the block through which they operate was split, the holes bored, the pluneers inserted, and the two balves. (Continued on page on)



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Name

r<sub>oy</sub> s<sub>int</sub>

#### MICROSCOPE ADVENTURE IN A FISH BOWL

Continued from page 98,

fastened together again. The springs were made by wrapping light piano wire around a three-eighths-inch rod, letting it unwind to relieve tension, and then forcing sections of proper leagth over the spool spindles. Dimensions of the parts are given in the drawing. These will vary slightly for different spools. Adjust the spring tension by cutting pletes from the wire, until a gentle pressure not sufficient to break a cover glass, is exerted

If you use your microscope for taking pictures of the wonders of the invisible world, it will pay you to investigate some of the more recent lighting devices. The small-size flash bulbs introduced not long agn make it possible to photograph live insects. protozes, and other moving objects. Flood lamps, the kind that produce 750 wates of light for two hours and cost thirty-five cents, are excellent for making exposures of specimens that do not move

A SATISFACTORY way of tuning flood tamps involves a four-inch piano-convex condenser lens. Place the lens from twelve to eighteen anches from the microscope mirror and the lamp, preferably in a suitable reflector, six inches or so beyond the lens Line up the lamp and lens until a bright beam is centered on the mirror and the illumination is even on the object You will have to judge exposure on the base of experience, but you will had that the flood lamp permits fairly short exposures and produces even flumings on without much fuseing

Now if you want to photograph moving spec mens, proceed as just outlined, until you have the image focused and centered properly. Then turn off the current, remove the flood lamp and lusert in its place a flash lamp. When the camera is ready for the exposure firs the bulb by turning on the carren and you have your picture. The run-tenser tens is necessary for best results The this lasts about one fitteth of a secand, which is ample for most purposes. You will find in the fish bowl many faccuating little asimals that will not pose willingly for the usual time exposure, but which can be kidnaped early with a fifteen cest flash built

#### RAISE EXPERIMENTAL HOPS IN FAKE SPRING

FARE winters and art ficial springs are enabling workers at the Oreson State Course to specif at their fight on the downs makery disease which attacks hope. The plants which usua y ros are five veirs to hear procacol. hope in three years under the laborators schoole of controlled temperature. Attr. being packed in mod and peat mose, they are (rozen for a certain length of time and then subjected to spring heat. Although it is aulumn outside the laboratory, the hope act as though a new spring had come and sprout or out on leaves. By this time-taxing methodthe workers have produced several hybrid seed#nss which are valuable as breeding stock, as well as testing out varieties of hops for their resistance to the mostew disease

#### MICROBES PHOTOGRAPHED ON MERRY-GO-ROUND

Withking 20,000 revolutions a minute, a microbe merry-go-round is helping scientists study the reactions of infinitely small fiving organisms. Invented by Prof. E. Newton Harvey, of Princeton University, and Alfred L. Loomis, of Tuxedo Park, N. Y., the merrygo-round spins on a cushion of air A tiny camera in a powerful microscope clicks as microhe passengers speed past its lens

### To those who think Learning Music is hard-

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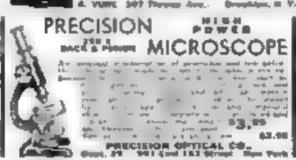
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#### A Microscope for Real Exploration

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THE popularity of radio increases by leaps and bounds. In the period of fourtren short years it has become a great American industry. And its possibilities have been barely scratched!

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Complete information will be sent upon request-just mad the coupon!

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#### HIS DISCOMFORT LED TO BUSINESS SUCCESS

SLOSHING about on also pery decks and puddled docks, going wearily burne with wet feet and greading the next. day when he must worm them into dry, barsh leather nt. in no wonder that Allen Drury began to study the



subject of shoe grease. That was five years ago when he was a longshoreman on the docks of Portland, Oregon

Now he is the manufacturer of a water proof leather dressing, in the early development of which his own aching feet were his principal testing laboratory. His business is now well established among the jobbers and dealers of the Pacinc North West. A great chain of sporting goods distributors has also taken on his line and is giving it national distribution in that field. Other branches of national trade are negotiating for it

Here is how Deary built the business beginning in the Fall of 1928. He knew nothing of chemistry or the technique of leather. But he wanted a waterproof dressing and be went after it as Edison would have done had be been in his place—that is, by making scores upon hundreds of experiments. He says that he mixed together a most everything in the world that was wet enough or sloppers enough to mix

Finally, he had the product, and having gone that far he decided to commercialone it. His first "commercial" batch was mused in the basement on an old range in two peanut cans

SO FAR, so good. Into production at last. Now for the sales end. The contents of the box cans, in next bule cans he took around himself to dealers stores. He didn't know how to sell, but would leave samples. After some weeks he would return to see if they had tried it. In some cases they had, and he would get small orders. It was slow work. In the first year he had disposed of only 60 dozen small cans.

Then, all of a sudden, it began to 'take," without advertising but by the grapevine route. From that time on the growth was almost spectacular. All through the depression, each and every month has abown an increase over the preceding month. From the 60 dozen in 1929, the lustness has grown until thus far this year, over 22 tons of the product have been sold, and another single order is in for 20 tons. (Continued on page 101)



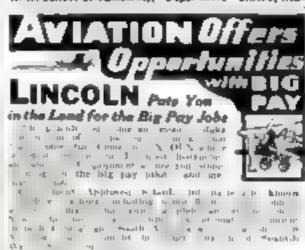
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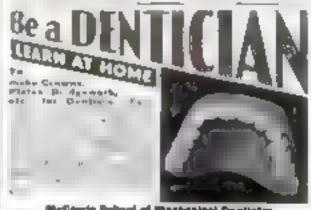
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#### Secrets of Success

#### HIS DISCOMFORT LED TO BUSINESS SUCCESS

Continued from page 100)

Nevertheiess, he still does his own mixing under his own secret formula. He has moved five times in five years (toto houses with bigger basements), and is still in the same kind of a lay-out—a great, rambing ald house, with "lactory downstairs, display and stock on the ground floor and living quarters above People are after him to show him how to tan his business in a "big way." They come and lay down cold cash and try to buy in. But he is firm in his intention to own it house, and make it grow hig but out of its own earnings.—H. W Y., Portland, Oregon.

#### TENNIS PLAYER MAKES SPARE TIME MONEY



I FINISHED at bool last spring and found myself without a job that would supply me with even spending money. Taking stock of my capabilities I found that about the only thing I could do even passably well.

was playing cenns—and stringing terms rockers. I approached the manager of he only local sporting goods store of any in portance with a proposition that he set me do his termis racket restringing work. Fortunately for me he had decided to do this work himself. I could see no alternative then but to go into the business independently.

A le er to a tennis string manufactarer whose name I obtained from a magasine advertisement, brought a prompt regive I purchased a small supply of a rings and the manufacturer included several display cards and a number of book ets to be distributed to tenna players. The sum of just one dotlar covered the cost of the essential tools-three stringers low's and a rubbet-covered cowet. I printed my name and address on he Tennis Rackets Strung sign and fastened it is the fence which surrounds the local public courts. Almost immediately business commenced coming The father of one of the my way younger players brought me a racket to string for his boy's birthoay. This job ! which took no more than a couple of hours net ed a profit of about \$1.75. A few days later a student at the local college brought me the rackets of two of his friends to be string with silk strings These tangible results increased my enthusiasm, and to (Continued on page 102).



#### COMPETE FOR AN ART SCHOLARSHIP

Copy this girl and send us your drawing—perhaps you'll win a COMPLETE FEDERAL COURSE FREE! This contest is for amateurs, so if you like to draw do not hesitate to enter.

Prizes for Five Best Drawings—FIVE COM-PLETE ART COURSES FREE, including drawing outfit. (Value of each course \$185.00.)

FREEI Each contestant whose drawing shows sufficient ment will receive a grading and also expert advice as to his or her chance of success in the art field.

Nowadays design and color play an important part in the sale of almost everything. Therefore the artist, who designs merchandise or illustrates advertising has become a real factor in modern industry. Machines can never displace him. Many Federal students, both men and girls who are now commescial designers or illustrators capable of earning from \$2000 to \$5000 yearly have been trained by the Federal Course. Here's a splendid opportunity to test your talent. Read the rules and send your drawing to the address below.

#### RULES FOR

This contest open only to amaleum, 16 years old or more. Professional commercial artists and Federal stydents are not oligible.

- 1 Make drawing of head 5 inches high, on paper 6 inches square. Draw only the gol, not the lettering or boider.
- 9 Use only pencil or
- No drawings will be returned.
- 4. Write your name, address, age and occupation on back of drawing
- 5 All drawings must be received in Minneapolis by February 20th, 1934. Present will be awarded for drawings bast a proportion and neatness by Federal Schools Faculty.

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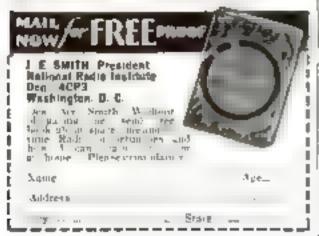
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J. E. SMITH, President National Radio Institute Department (CP) Washington, B. C.



#### Secrets of Success

#### TENNIS PLAYER MAKES SPARE TIME MONEY

Continued from Dige 101)

the sign hanging at the rourts I added a small hox containing booklets of "Tenns Hints' supplied by the tennis string manufacturers. Inside the front cover of each copy I had rubber-stamped my name and address. This mexpensive advertising brought me several jobs a week during the tournament season at profits ranging from \$1.75 to \$5.00 on each

I had obtained, direct from the manufacturer, a particularly handsome racket for my own use, and a prominent local player was so attracted to it that he demanded one "just like it". The profit from selling the racket was so welcome that I decided to take a chance, and I utdeted eight additional racket frames. These were disposed of atrung to order long before the season was over. Indeed I had to order several additional rackets after the additional supply was exhausted and might have sold many more had they been on hand.

The sale of tennis balls, racket covers presses, tubber grips, and similar accessories, together with repair jobs, brought in a number of extra dusars. The total profit for the few months of easy work requiring only a few spare hours each week exceeded \$125.00

Forearmed with the knowledge that there is plenty of profit in the tennis racker. I shall next spring rent a small since or space in a larger one, and connice wholeheartedly in this incresting has ness. D. B. H. Clinton, lowa.

#### Cash Prizes

THIS department will give \$5.00 for every true success every submitted by readers of Popular Science Monthly, and which is accepted for printing in this magazine.

Manuscripts will be judged on the individual merits of the case and circumstances involved. Only atories in which the author's success, or that of some one known to the author, has been gained by some method of educational guidance, fitness for the job, or application to the work will be considered. We are not looking for the "get-rich-quick" type of story.

Manuscripts must be confined to 500 words or less. They must be true and, if accepted, authors must be prepared to give us signed statements to the effect that they are true. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless postage is provided for this purpose. Address contributions to Success Story Department, Popular Science Monthly, 381 4th Avenue, New York City.







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Always mention Popt LAR Science MONTHLY when answering advertisements in this magazine.

#### A QUICKER WAY TO TIE SOUARE KNOT WORK

AFTFR the square-knot enthusiast has had some experience in making belts and other usable articles with cords and knots, he will save considerable time by mastering the unique tie shown in the accompanying photos. The

new tie enables the worker to make the knot in one quick uperation, but it must be practiced in under the olitano speed. Only one con need be knot the whet talling tres at omatically

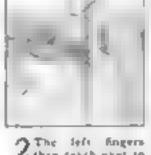
The first operation is to start making the first half of the square a not in the usual manner, as shown in Fig. 1. However, do not pull out the cord

shown in the left band Draw it back slightly with the thumb unt . the loop is around the first two fingers, then, with these fencer reach over the two ree tords that are held faut by the square-knot book and grasp the cord held in the right hand, as to Fig. 7 The finger and thumb of the right hand then reach

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Fig. 2 as shown in

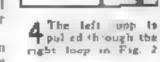


3 The right thumb der the two tool colds

Fig. 3. It is not reserve that the right hamp and finger pass only under the cords caucht on the knot hook, and not neumned the knot cord. The loop is parel on through

the loop shown in the right hand (Fig. 2) and should then appear in a familie a inhie 4 Pay the cont in the right hand entirely through the knot and the tangle will disapteur The ordat the git will crop the leasing a completed square knot ready for (reham no

With the regulation method of tying one



half of a square knot at a time, it is necestary to pull the ends of the cord through each knot twice.- KEVNETH MUREAY



The right-hand cord is finally pulled through

#### How to MAKE MONEY with W Camera

THINK HOW MANY PHOTOGRAPHS ARE IN THIS ONE ISSUE OF THIS ONE MAGAZINE Multiply that by the 34,487 publishers who MUST buy photographs, THAT GIVES

an idea of the pictures being bought EVERY MONTH' SEVEN MILLION A YEAR is the conservative estimate

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# Tripod Floor Lamp

GIVES PRACTICE IN FANCY WOOD TURNING

By Herman Hjorth bother the Bossella Courtes

\*LOOR lamps are indispensable in the R mostern home. The are der statiste and u-eful and their mellow light is kind to

Fur one who has had some expenence and practice in wood turning, the construction of this lamp should prove quite simple The turning of the lower column needs no further explanation than that contained in the detail drawing. Have its upper end run on the dead center because of the hole to be bored in it.

Its alenderness makes it necessary to steady the upper columb during the turning proce--If your lathe is not furnished with a back rest, a homemade one, as shown in the sketch, can quickly be made. To avoid butning by friction, the stock should move treely in the square opening, and it should be rubbed with a piece of dry soap. The bi-to, hole in the end may be bared by moving the steal test to the end of the piece Le cother a lot held m a lothe chuck or a 4 10 skew chisel

The square hole in the steady rest is now enlarged to 61 the top of the lower column. in which the tu-in, hole for the end of the

upper column is bored

The table should preferably be turned from a solid, well-seasoned board. As thus cannot be fastened to a faceplate in the bount way because the screw boles would mar the work, it is necessary first to turn and tace off a rirrular disk 12 in. In diameter and at least 11/5 in, thick. This may be made of any soft wood such as poplar or white pine. Now saw the table to its anproximate shape and give it to the circular slisk with a piece of paper between the two, When the glue is dry, the turning is done in the usual way. Turn the upper side of the

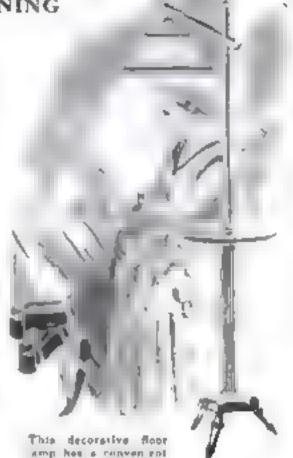


table first and bore the Moin, hole, When finished, the table is separated from the pine thick by inserting the blade of a thin chair between the two. This causes the paper to split. A chack is now made from the dok by turning a projection 10 ln. in diameter and 1/2 th, high on it. The recess cut in the table must fit tightly on this while the lower side in turned and the hole bured for the lower column. I your as he cases not swing 12 in, an ordinary round table too can be made by hand

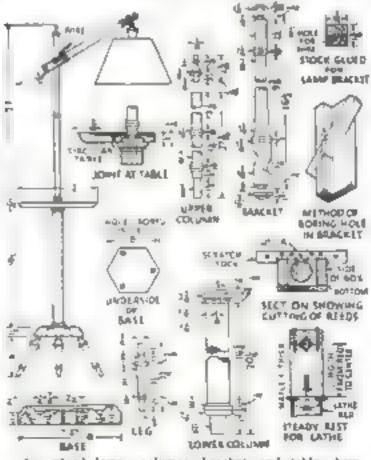
little table harlway up

The stock of the base is next sower to a circular shape. Before screwing it to the

faceplate, place a piece of thin a nod between the two. This is done to prevent the chisel frum cutting into the from when the hale in borrd. After completing the turning and fitting the end of the rolumn into the hole remove the base from the faceplate and lay out the hexagon on its underside as shown. Saw away the waste wood at an a hale.

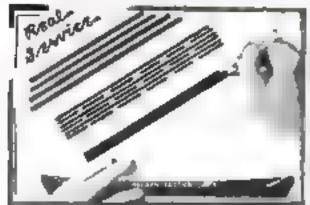
Turn the three less accord as to the detail drawing and hore holes for them in the base at an untile of 60 der. Make a beeting jip from a piece of 11/4in stock and clamp I over the point where the hole is to lie bored. In this way all the holes will be bored at the same stant

The bracket must be made of lare record, in the center of each of which a groove 1/2 by a in. is cut for the electric These pieces are then WALES. graed together. When the glue is dev. a ei-in hole is bored at an angle of 50 deg in one end Note the boring jig shown in the sketch. The bracket is finally turned between centers. The two buttons that fit over the ends are turned on a screw

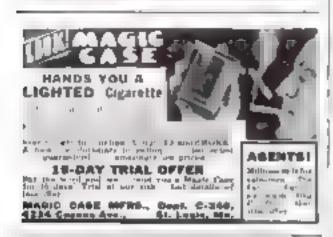


Assembled lamp columns, bracket and table how the base is turned and cut becagenal, other details

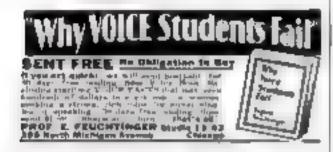




PERFECT CROSS KATCHING MADE QUICELY A MODELIN COME TO CAN'T IN THE PROPERTY OPERATE HE STATE OF THE PROPERTY OF TH











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chuck. The bracket should slide easily, but not too loosely, on the upper end of the

The reeds on the bracket and lower part of the column can be cut as shown with a scratch stock (see P 5 M Dec 33, p 80 Make a box as indicated in the sketch and support the column on two screws passing through the ends of the box. Find the length

### List of Materials

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North All dissensions are in lackes and are feathers users

of the circumference of the column by wraptime a strip of paper around it. Divide this into twelve equal parts and lay out on the surface of the column. Wedge the column in the box and scratch a reed at every

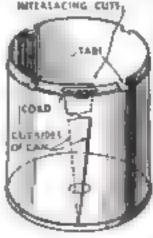
The finesh may be applied in the lathe as each piece is turned or in the usual way after the lamp has been glued together (For information about finishing see P. S. M., Dec. '33, p. 81.)

# GARDEN STARTING POTS MADE FROM TIN CANS

ORDINARY tin cans make cheap and convenient pots for the indoor raising of plants that are to be set out in the garden later on. Take any can 3 in or more in diameter and cut the top rim off. Then punch a hole in the bottom with a spike for dramage and cut the can down the side to the boltom. About 1/2 in from the top of this cut, make two horizontal cuts about in deep. Then make four tabs spaced equally around the top rim. Squeeze the can together at the cut down the side, interfacing the two horizontal cuts near the top,

and tie the can with a cord. Bend down the tabe at the top to hold the cord in place L ne the usside with paper to prevent durt and water from seeping out through the side

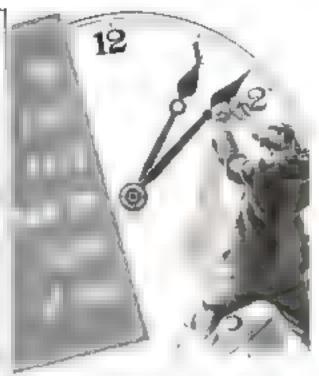
When ready to transplant from the can, cut the cord holding the can together, spread the can apart, and slide out the cylinder of soil. Fred off the paper and plant-R. R. Bunn.



How to make starting pots from taxes

# LACQUER PRESERVES DOCUMENTS

Valuable papers can be preserved indefinitely and prevented from becoming yellow by spraying them with ordinary clear, quickdrying lacquer that has been thinned with acetone. The lacquer should be applied to both sides.-G. S. G.



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# NEW CHEMISTRY TABLE FOR HOME USE

(Continued from page 64)

To attach the back assembly, engage dowels in the front edges of the stales with boles bored in the notches of the top to receive them, and strew the plywood back to the table top. Brace the stiles at right angles to the top while this is being done

Cut a piece of plywood for a door to slide between the stops in front of the two opper shelves, and serew on a wooden knob. This serves to keep children from getting at small bottles of dangerous chemicals that are stored in the top.

The lume cabinet sashes are downled together. They are made up of square-edged stock, with the glass tubbet formed by mitering a rabbeted molding around the glass openone after assembly. Pine strips 1/2 by 1/2 la., rabbeled 16 by 16 in., are excellent for the purpose. Pit glass strips 16 in, square inside. butting the corner joints, but leave the glass out until after painting

Hang the left sash Bush with the inside of the end stile, using surface houses. The right such, however, has hone-pin hinges screwed to the back edge and mortised into the stile the door edge being I in, back from the sale



Left end of the mate bench frame with the Iront drawer sails nation soluly in place

edge. To enable the pins to be removed, gouge grooves alloye them.

Hang the frunt door to the left sash and screw on two small, flat hooks for latching Bevel the edges for free elearance. To fosse the cabinet, remove the pins from the front door, swing the right such against the back, -tand the door against it, and close the left sash over it. (The designations "right" and 'ieft" are from the user's standpoint

The hood may be made of an vanized iron or other sheet metal. A t nner can do the work so easily and cheaply that it is hardly worth while to build it at home. Nati it with brads inside the aprop clouts

To make the cabinet tight, glue strips of felt along the inside of the bood apron below the cleate and under the front cleat, inside the center back stile where the door opens against it and along the back edge of the left door and both edies of the front door Strips of



The top drawer bitted with a tray for holding glass and rubber tubing and amail seems

rubber from an old inner tube to ght be substituted. The lower edges of the sushes may be sealed with weather strip

The base consists of three main pieces, mileved at the curners and attached with blocks to the underside of the cabinet. The setback gives toe room when one stands close

To bold the dishpan sink, build an inclosing frame to attach to the table end by means o to 9 in steel brackets.

The water bottle shelf is 81/2 in, square notched around Continued on Jage 107

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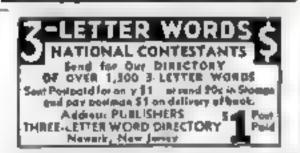
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# NEW CHEMISTRY TABLE FOR HOME USE

(t a med from page 1 th)

the lack is le and exempted on two small brackets. Tack a small wait around the edge to keep the bottle from shoping off

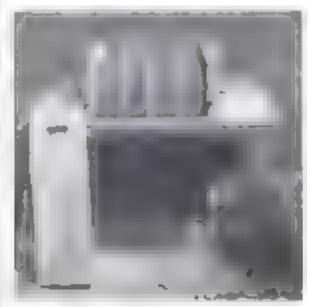
Before utting and hunging the emploard doors, stand the cabinet in its permanent place as the frame spraces to suit the floor

Mortise a small lock into the back face of the right door and put an elbow catch under the upper shelf. The drawers can be made secure by boring through the partition into the drawer order, for inserting females of dowelne screwed to small knobs. In this way the arawers cannot be opened until the supboard & unlocked

Paint the top of the table with some good alkahandacidproof material. If a ready-mixed point is ool easy to get, ook your own accord ne to a recipe found in any comprehensive formula book. Two coats of boiled linseed oil are sufficient for the rest of the calinet

# CORRUGATED SEPARATORS USED IN PLANT BOX

SEEDLINGS grown individually have a much better hance to develop complete most systems, and consequently make be enprogress when set out than those prosped tage her in a box or hed It it such plantane a knockdown how may be made to utrace the corrugated board separators from tood staff ractions. The box dimensions should be planned to suit the separators used. In this case they were taken from a calsup carton The ends of the box are murised and tenness as shown and a bok is buried through the tenon to enable the use of half-tound



Seedling box with one end removed to show the partitions, which are corrugated board

wedge keys for locking the party together The hos is raul a sembleo, yet may be street in a small space.

At planting time, when seedlings have at tained proper size, one or more of the detachable sides are removed, a long thin knife is run through to dit the corrucations and the right cut unto twenty your sections each holding one plant. These braks hold their shape while transplant no and the conflets within are undeturbed. Plants thus moved continue growth without willing

Painted, these boxes may be used over and over. They prove a real help to the namener in both veretable and flower cardens Erros Steamer

When pedering back lesses of Port Lak SCHNER MONTHLY, please and as cents for each linne except the current one and the three insues immediately preceding. These four lianes are only 15 cents ouch.



YES SIR! Three inches of muscles added to your chest and at least two inches to your biceps, or it won't cost your penny. While my course is not infallible . . . so many of my pupils have gained tremendous physical development that I am willing to stake my reputation that I can do the same for you . remember . . , if I fail it costs YOU DOTHING!

I want to tell you fellows . . . there's something about this "strong man business" that gets you . . . thrills you! You!! get a great kick out of it . . . you'll fairly feel your muscles grow.

There sharps is lower who are discouraged are the men I want to work with blairs an underweight weaking has come to me for he prompletely discouraged. I have developed a see he stant's physique for them... covered their bodies with layers of most in ... made them see ng and proud caper and ready to face the world with their

Take my fell enerse, if it does not do at I my of you are not completely satisfied and son be the sudge . then it was t cost you are pency!

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you the secre a of strength insurated and explained as you like him.
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Rush the Coupon TODAY! Made our order to when I will are place. Fig. 4 - 1 York North North 4 Dept. M - 4 - 25 VINCE D. N. The close conbe a 199 t REE 181 N I the mater combonition between the combonition between the combonition and the combonition of the combonities of the comboni



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# SATURN'S RINGS AND CANALS OF MARS

(Continued from page 11 /

in photographs of our typewritten Mars model, as they do in the original

An experiment which you can perform with two disks of cardboard joined by a bar shows the remarkable way in which the earth and moon revolve, each month, around their common center of gravity

To make this idea plans, cut out cardboard circles eight and two inches in diameter, and join them by a strip so that the circles are separated by six inches. The center of gravity of this unequal dumb-bell will lie somewhere along the line joining the centern of the two disks. Find it by trial, puncturing the card with a pun until a point is found where the disks balance each other This is the center of gravity

Around this point draw a circle that passes through the center of the larger disk representing the earth. From the same point of balance, describe with your compass an art passing through the renter of the smaller disk, representing the moon.

If this earth-moon is stem is then whiried I around a pin through the center of gravity, it will be seen that the centers of both earth

and more revolve around it.

To find where the center of gravity lies in the real earth-moon system, you must constiter that the mass of the earth is eighty-one times that of the moon. The moon's center is therefore eight vione times as far from the center of gravity in the carth's center is. With the moun's distance of 240,000 miles. the common center of gravity falls at a point within the earth, at about 3,000 miles from ats center. When the moun is in the zerath straight over your head you will therefore anew that the entire earth moon saylors is revolving aroung an axis about 1,000 more under your feet. Accordingly the earth's center ravely each month, around a circle 6,000 miles in dumeter.

# LABORATORY TESTS OF HOUSEHOLD CHEMICALS

(Continued Jeom base sc)

The fact that sodine solution or a weak tineture of sodine turns have when nutsed with starch, provides the home chemist with an excellent test for starchy materials. Its presence in potatoes, baking powders, desert powders, and other cooking incredients can be detected easily

To prove that alcohol is present in a simple mixture, simply heat some of the liquid in a test tube fitted with a cotton plug that has been dipped in an afferienc solution of polassium permanganate. If the slightest trace of alcohol is present, the cotton plus will are cross as the values paraller such to

The presence of cotton or other adulter ants in woul fabric may be determined by a simple test. Count the number of yarns or threads in a small square of the cloth and then immerse it for exactly ten minutes in a nently boiling, five per cent lye solution This solution can be made up by dissolving one teaspoonful of struck bye in twenty leagrountule of water. At the end of the tea entoutes, what is left of the square of cloth is removed from the solution, washed, and the remaining threads counted

The woolen varus in the misture will be entirely dissolved, while rotton or linen threads will be uninjured. Wool is the only common textile liber dissolved by this treatment, so the amateur analyst cannot go far wrong By dividing the number of threads remaining by the count in the original and multiplying by one hundred, you can obtain the percentage of threads, other than wool, used in fabricating the mixture

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# MECHANICAL MARVELS SPEED BOULDER DAM

(Continued from page 19)

hig test laboratories on the ground, place a dozen cylinders of concrete a day between the plates of giant screws, crushing them to check on the hardness of every batch going into the date. The tests are made on cyliniers cust eight hours before. Thus, if need be, construction can be halted immediately to replace faulty concrete

EVERY day, whole trainleads of cement roll across the desert from the five Callfornia factories where it is manufactured Coming from different locations, it has sughtly different colors. To avoid unsightly patches on the face of the dam, all the variculored particles are mixed by server conveyors until the cement becomes a standard hae. Then it is blown through pneumatic tubes, sumetimes as much as a mile and a hal to the cent al maxing plants where wa or and 280 kimbs of gravel are arbied and the whole stirred by mant machines into smooth concrete. Twelve men, working in here shifts, turn out ten-ton batches at the rate of one every two and a half minutes

Haulen by one true trains the batches of concrete go to tun efferent levels, to syoid congestion, and rice of caldeways across the canyon to the particular column under constreet um. Men sum our en the com with telephones in their hands, guide the slow no down and stopping of the bage buckets By the rules of the povernment experts, no concrete is to be dropped more than five feet. Otherwise the heavier rocks might settle to the bottom and a muture of unequal consistency result

BY THE time the pouring is completed. will have crossed the cubleways over Bark Canyon. Five of these cableways will then be dismontied. The math, however, the argest in the world, will remain to carry turb nes and other heavy machinery down to the power pant soon to be erected. This rankery has the three-meh cables of steel

tunnt air cannons, firing concrete under a pressure of 100 pounds per square tech, form another spectacoust feature of the work They are used to one he roofs of the four fi our tunners that have been blasted brough the soul rick to dwell the river around the dam whose it is being built

When the work a implesed and the vast reservoir builds up behind the dats, these cannels will be employed to carry water to the turbines of the power plant. The concrete lining, however, will not be called upon to withstand the wear and tear of the each ing water. Special hard carbon steel pipes that's fee: in hameter and polished smooth as glass, will do he july Inside these paper the water will race to the steeper penetocks. thirteen foot tubes of steel, where it will reach a speed of 120 tales an hour and develop four tames the power created by Magara Falls

The two und a half miles of pipe accessary for the work will cost \$11,000,000, aparox mately one fourth the cost of the entire dam. The tipes will be rouled from steer to heavy that we sheets make a load for a rallway car. There sho is each nearly three inches thick, zo into every twenty f sur-foot section

During the next twelve months, the pour ing of the concrete will be completed. In another year, the building of the power bouse and other permanent structures will be well under way. The erection of this greatest water wa of all history will soon be a reality accomplished through the help of pover methods and scientific aids





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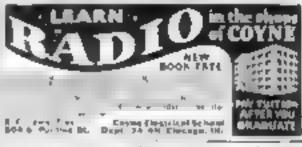
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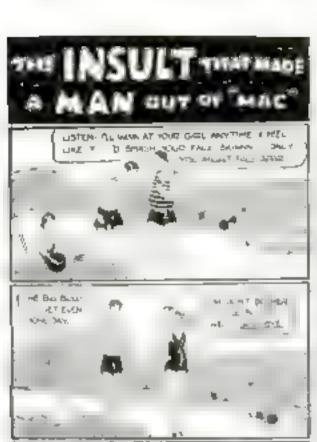
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# EXPERTS SEEK WAY TO SAVE WORLD'S SWIFTLY VANISHING RECORDS

(Continued from page 14

of the future. It is bow to extend the pic of printed matter and prevent deterioration of books papers and magazines. This is the end toward which recent enorts of science such as the designing of the Vational Archive-Hailding in Washington, has been directed

Some years ago, the London Society of Arts and Sciences became alarmed at the manner in which leather bindines on books disintegrated in a few years. A special commission spent five lears in an exhaustive study and reported that mineral acids such as sulphone arid, which are non-emitted in place of oak and sumae for he tannons caused the bindines to deca. As I to a most impossible to obtain leather tannel in any other was mineral percent of the books in the main New York City library, for instance, are now bound in cloth.

AT THIS library, which bouses nearly 1,000,000 volumes as well as manuscripts that date back to the Tenth Century, continual research along the lines of book and paper preservation are being made. Some of the tests have been carried out in conjunction with the U.S. Bureau of Standards Rag paper, semi-tar boards, lines thread and backram bindings have been found the most enduring materials for modern books.

Books, and even newspapers, published before 1870 were largely printed on high-grade rig paper and have withstood deterioration much better than later publications in the New York Library, for instance copies of newspapers more than a century and a quarter old, are still a excellent condition. In the name file rooms, however newspapers of the 1880's and 1890's are so disinterrated that they cannot be rebound

This is accounted for by the introduction of chemically produced wood-pulp paper which deteriorates rapidly when exposed to ight and air. Preserving daily newspapers, which will form the textbooks for future historians of our rapidly changing era, is one of the most urgent problems confronting the experts

At first, they patched the brittle pages, as they grarked and ture, with transparent adhesive tape. Then attempts were made to cover the sheets with liquids that would harden and protect the paper. Shellac, diquid celluloid, turpentine and paraffia, flevible varnish, nitro-cellulose, and a preparation of lineard oil and rosto were tried with varying decrees of success.

Some were oprayed on, others brushed on others applied by dipping Each had its draw-back. Some of the treating fluids made the paper transparent, some made the ink run, some left the surface stocky, and all were expensive and hard to apply

O THE experiments at the New York Li-So that experiments transparent material to the face of each lage. Silk chilton was lested first It case the paper sufficient strength but its open weave allowed the are to reach the wood fibers so the oxygen at tacked the efforme in the paper. Now Japanese from hardly inclhow andth or an inchthick, is glord with wheat flour paste to both sades of each sheet. Only one half loch is added to the thickness of a secume conlaining a month's daily papers by the proreduce Tests have shown that the fissue is stronger than silk. Where covering a sheet of newspaper with silk cost in the neighborhood or seventy five cents. Japanese tusue can be applied for eight cents.
Since 1914, the New York Library has

Since 1914, the New York Library has been experimenting with this method of treatment. Each year, several papers are bound in this manner, the cost being borne by the publisher and the copies being kept on file in the library. One newspaper in publishing its own rag-paper edition. This is expected to have the same lasting quality as a well-made book

AT FIRST, posting the tissue in place was a slow inborous process. Recently special machines have been developed to speed up the work. After the sheets are treated they are hung up to dry and then run through the steel ruliers of a gas heated mapple that from out all irregularities.

An entirely different approach to increasing the life of newspaper records has just been announced in Rochester, N. Y. Roy S. Hopkins, research worker at the Eastman Kodak Company, has designed an apporatus that permits newspaper pages to be recorded on tiny films and then projected on the occurs of a viewing device which reproduced the page half again as large as the original

fight pages of a newspaper can be copied on a strip of film one and three-eights inches wide and less than twelve inches song. The safety film, being more chemically stable than paper, can be preserved in files indeener In the viewing apparatus, a can not which occupies relatively little space on a table, the pages are either thrown upon the screen at the bottom or are copied full size on photographic paper. The person consulting the files, can move the film to produce the page he desires by means of a simpar hand lever at the side of the apparatus This new method of recording newspapers in permanent form allows a month of fiftypage papers to be stored on a sincle reel of film four inches in diameter, and, a adopted would make unnecessary huge storage racks for bound volumes

At the same time, other workers are advancing a wide variety of additional suggestions for preserving the records of our times. In England, the British inventor Everard Digby, has perfected a method of writing with platinum on sheets of gold. These two metals are virtually unaffected by weathering and decay and, according to the inventor, records made on them would had forever. He process consists of forming the platinum letters on sheets of gold about as thick as ordinary correspondence paper. Recently it is reported, he was employed by the Duke of Norfolk to reproduce impershably as unclear document that relates to that nobleman's family

Frequently experimenters have tried to impressate paper with various metals to increase its life. The result has been to injure the fiber of the paper and decrease, rather than increase, its durability. However, it is formable there has succeeded in accomplishing the feat by means of a special atomater that sprays the paper pulp with a protective coating of tim, copper, or aluminum as it is being manufactured.

NOT lone ago, in New York City, Dr. J. Broadman, a physician, amounced the perfection of a secret chemical process which he are makes paper victual a mass cuttle When the sherts of a newspaper are dippedinto his varnishike solution, he reports, the release strength is increased twenty fold and the print becomes more legible.

Thus by developing newer and more durable materials, on the one hand, and by producing scientific storage places like the new National Archives Building, on the other, experts are seeking longer life for the records

of our times and civilization.

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# The First Step

First secure an experienced Parent Altorney to sook after your interests at Washnation. It is not the part of wisdom to put off or delay. And remember 1. S. Patent protection is the only way to obtain the ear as we right to manufacture, use, or seleter invention.

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# BREATH-TAKING STUNTS TEST NEW PLANES

(Continued from page 23)

driver tries to change his direction of travel. It is for that reason that we seek to learn the exact stability of each airplane, so as to make its flying qualities most pleasant for the passengers and easy on the pilot Thus we determine the exact forces required to control these shaps, as well as the effectiveness of these controls as they cause the planes to be maneuvered. Stability is the fundamental unricely as these two qualities, and we measure stability as I have described qualitatively through its oscillations when pulled off balance and quantitatively by measuring the forces on the controls.

WE HAVE not yet finished our tests in the nertial laboratory. What is the ship's performance? We must measure its speed within one mile an hour. Why most we determine speeds so accurately? Both because the manufacturer guarantees a certain speed even before the surplane a built, and also the airline operator must know if it can be operated economically whether too much eas it he will pour lown the hungry throats of the engines as they roar across the continent at high speed

I sat at nest in the cockpit at Winslow Arst., the other day, the engines ticking over in unison with a procise of plenty of power for a unique flight. The field her about a mile above sea level, and we soon were to ask one encine to lake us off the ground and fly us to A burgoercue, 214 teues distant, with a full load. Never in the history of aviation has such a task been required of one engine at the moment of take off in a big machine

As I cat wanting the signal to take off from the Womdow field. I felt sure of success. Quickly we enthered speed when the starter gave to the word. After traveling only half the length of the runway we were rolling 100 miles an hour, although the wheels had not wel left the ground. A moment later I reached forward to cut the switch on the left encine- and off we went

Though that touring power plant was hauling hearly time loss of machine, lead, and people through the air, I never revived it up to full power We circled the field, gaining altitude, and when we had climbed a thousand feet, I dumped a half-ton of gasoline, leaving enough in the tanks to carry us to our destination. Valving the gusoline was not a stunt in any sense, but was done to demonstrate that, should an engine cease functioning with a load of possengers, the ship could be flown to its next stopping trace with case. So easily did we complete the flight that I dimbed to \$300 feet to get over the continental divide on only three-fourths of the power from that one engine work he alone

Until the god year mest increases in perplane speeds have been achieved through higher-powered engines, with little thought to the comfort of passengers. We began, not with a given sleed plane, but with 1,400 horsepower, represented by two engines, and designed the slane to fit that power to the resulting vehicle the world sees for the first t me a multi-engined ship of the air that will d harns off on only one engine, so perfect v is it balanced.

IT Is comfortable, but how about the none? We have learned that ansickness traces back to irritation caused by vibration and the steady noise from propeller tips engine obration, and engine turning at datesent speeds. On our first flubts when the cabin wa only an empty shell, not even shouls round he heard. Then we began to measure the calin poise, (Continued on page 113)



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e Conserves

# BREATH-TAKING STUNTS TEST NEW PLANES

(Commacd from page 111)

with listening phones leading to the sources From this we learned where the sounds could be softened most effectively

Of course, the acoustical engineer was consulted before the ship was built. Then by installing 200 pounds of soundproofing material, reducing noises at the source, scaling the color acoustically, reducing vibrations and rattles by such devices as doors locked at four points, and absorbing with soft materials much of the sound that actually enters the tabin, we attained an airplane whose passengers artually suffer less noise than they would hear in a pulmap care in coudest weather the temperature may be varied at will by steam heat from a tiny boiler behind the engine and by regulating the flow of air through the cubin.

ALTHOUGH they have achieved a comfort thought impossible two years ago, these ships attain high-dying speeds and lowlanding speeds. Uncle Som, through the Department of Commerce, seeks to hold down he landing speed of transports to sixty-five miles an hour. Gradually we have been in creasing landing speeds as truising speeds have jumped, though by no means in the same proportion. Air transports in time will be truising 300 miles an hour across the contional

Four honored miles an hour? Undoubtedy we will reach that speed with safety at
very both a hitself through our experiments
in high-flying laboratories. Already we are
able to shift geam by changing the angle of
attack of the controllable peopetiers after
taking of. This permits us to leave the
ground with the chaines detivering full power
at high speed, then to throttle back while
increasing the propeller's bite and maintain
ing high speed with the engines turning more
slowly Controllable pitch props eventually
will make it provide for us to ascend to
great heights, where storms never brew, and
yail at velocities not now possible

# THIS SIMPLE MONITOR CHECKS TRANSMITTER

(Continued from page 61)

locked at this point, you can tune the transmitter by adjusting it until the sheads are heard in the monitor carphones

As you transmit, you then can use your monitor to listen in on your own signal. If at any time you must move the dial of the vernier condenser A to tune in your signals it indicates that for some reason your transmitter has slipped off the desired frequency

The usefulness of the vermet adjusting consenses comes into play particularly when you warn to test the adjustment of your transmoter at any time during a long sente of transmoter at any time during a long sente of transmoter amateurs, you probably will find one spot in one particular band that seems to give the best results for your conditions. If this is the case, you no doubt will adjust your transmitter to that point and laws if there. Your monitor then can be adjusted to that one point and the vernier dial alone used to indicate by its plus and minus whether you are below the desired frequency, above it, or directly an it.

Once you have calibrated your monitor, you can connect it and your receiver to a single pair of earphones through a double-pole, double throw switch. When receiver side and when transmitting to the monitor side so that you can have a continual check on the quality as well as the frequency of

your signal



Don't think that to be profitable an idea needs to be complicated. Simple articles—just a person's hunch—have often proved profitable. The crinkly hair pin, the metal tip for shoe laces the paper clip, and literally thousands of simple things that most of us unconstantly were all the product of tovention. Also improvements in patented articles sometimes provement profitable than the original article listle. If you have an idea—at least see what its possibilities may be and HOW YOU CAN PROTECT YOUR OWN RIGHT TO IT

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# VAST COUNTERFEITING RACKET FLOODS MARKET WITH FAKE PRODUCTS

(Continued from page 31)

tickets are to be printed. For an important event, a special design is made a part of the paper itself

Yellows, golds, and oranges dominate the colors of the finished ticket. This isn't because sport fam crave richness and beauty. but because these colors are most difficult to unscramble. Even a craftsman of more than ordinary skill may lose details in photographing them. An additional safeguard is an elaborate raised seal placed on the back of the ricket by a secret embossing process

All this has not deterred crooks from making counterfeits and selling them to in-meent purchasers. But never since the new tickets were devised has the holder of a fake ticket been admitted to a fight

AT ONE large event in New York City the burried ticket-takers accepted some skillfully printed counterfeits and tore off the seat stubs. But each time, that little routine action discoved the fraud. The lake tick is ture like ordinary pasteboard. Whenever a genuine ticket was torn, its jagged edge showed that the card was made in three distinct layers. The two outer ones were total. The center one was blue

A new paper, developed by another company, is being introduced to manufacturers of various products. When used, it will probably cause incidents resembling dem

enstrations in maric

A detective may graming a package of razor blades of a certain brand. He unwraps the third blade from the top of the pack. and moistens the paper Nothing happens "Fake," announces the detective

He takes from his pocket a genuine wrapper, seemingly the same as the other Fle wets it, and the blade manufacturer's

trademark appears?

The trick is accomplished by printing on a sort of base paper which is afterwards costed with a mixture containing casein and city. The conting makes a blank, smooth surface, which can be printed on again Monture or a strong beht will disclose the design underneath

Hutten markings are already in widvorue. Counterfeiters overlook them, they make it easy for investigators to distinguish the real from the spurious. Some manufacturers outsmart crooks by symbols stamped in place sight, but continuedy changed ac-

cording to secret codes

The number, the magnitude, and the daring of counterfeitung plots today are explained by many theories. One explanation is that during probibition, grooks learned the comparative case with which figure labels could be counterfeited and decided to try the same scheme in larger fields

SKEPTICAL purchasers of whisky, during probabilion lauched at the imported labels on bootles stuff Yet many of them, mixed it unanowingly with bootles ginger ale. The faking of that ginger ate a leading brand was one of the largest counterfeiting operations uncovered in recent years

One of the chief figures in breaking up the plot, was Sam Friend, a special investigator Representing various drag and food companies, he has probably taken part in checking more merchandise counterfeiting schemes than any other one man. With an office in New York, and contacts all over the I mited States. Friend has set out to be Enemy No. 1 of counterfesters

He tracked the mager-ale fakers by folowing one apparently insignificant cine. The bottles were packed, like the secuine, in wooden cartural nailed shut and bound with

wire strips. Friend found where the strips had been bought. When the crooks came for more, they were followed to their own plant

Detective work indeed is one of the most important weapons in fighting the counterfeiters. Not long ago it was called upon by two of the largest watch companies in the United States.

Watches bearing the companies' names were received for repair. When the cases were opened, the works were found to be of different and greatly inferior makes. They were of the cheapest kinds, some of them old and worn out

THE workmanship on the face of a high-grade watch makes it a thing of beauty One style is an example of the pains taken The numerals and company name are engraved on a metal dial. The entire surface is then covered with enamel, which is ground and polished, until the metal is hright

These counterfelt watches, however, had the company names painted on them. The work had been done by a stamping machine such as is customertly used for repair work

The matter was taken to the New York police. Captain P J Mcleigh, of the detective division, put men on the job

The detectives opened a jewelry store of their own and through it not in touch with the counterfriters. They shadowed them, and found two dist factories, with thousands of dials already stamped with expensive names. and ready to be fitted to cheap works,

The trick of using 4 legitimate article as an aid in creating a spurious one, has many

In 1930, the Newfoundland government authorized a special mone of stamps for the Boyd-Connor transatlantic flight. Upon the faces of engraved startips of a regular base special lettering was printed with hand-set type Only 300 were made, and almost immediately collectors were valuing them at about \$500 aptece

Simultaneously with the appearance in this country of the genuine stamps, there was a food of counterteits. The lakers had brught cegular, engraved stamps, and had done their own printing over them

\*OLOR happens to be one of the most Control stumbing blocks for counterfeiters. A few months ago a large New York bank rewarded a clerk who had become surpleacus of a check, drawn for a large amount, on one of the bank's regular customers. The signatures appeared perfect, but the cierk thought the pinkish tint of the labouraphed background was off-color Investigation proved the signatures were forgeries.

Several months ago, the police commissinger of New York City decared the lives of hundreds of thousands of people had been menaced by counterfeiters' operations.

This wholesale attack on the heath and ide of men, women, and children." he as serted, after the arrest of several gangs, was the most victous ever prganized Whether deaths were caused as a result of poisonous substitutions we may never determine. The fact that so many of the persoms endangered were children, and that many others were poor or aged or ignorant emphasized the horror of the trade"

It was found that children had suffered convulsions from take lagatives, ulcers had been caused by cosmetical injections were brought about by lipsticks; counterfeit mouthwashes injured throat membranes, and disinfectants and deodorants that were supgosed to be harmless, killed rats and raibuts in laboratory tests

# TROUBLES THAT MAKE CARS OIL HOGS

(Continued from page 62)

pipe. As the gases struck the metal, a misty coating of water formed on its cold surface.

"You see," Gus said, pointing to the tiny droplets that beaded the metal, "water and unburned gasoline. It's our old enemy dilution. Every car has it, but leaky pistons and rings allow more of it to reach the grankcase."

"Isn't there some way to prevent it?"

asked Messler.

"Sure, but you can't eliminate it entirely. The best safeguard is to keep your motor in good condition. As for your driving habits, don't use your choke any more than you have to. You know, Tom, you probably won't believe it, but everytime you yank your choke button all the way out to start a cold motor, you force several ounces of raw gas into your crankcase.

"FOULED spark plugs and a skipping engine help to dilute the oil, too. Some of the unburned gas is bound to find its way past the pistons into the crankcase. And a carburetor that's set too rich will do the same thing."

"How can you tell when your oll is so diluted that it lan't doing its job?" asked

Messler,

"There's no way that's particularly accurate," confessed Gus. "Maybe some day automobile manufacturers will equip their cars with some sort of dashboard meler that will measure the viscosity or thickness of the oil in the crankcase. Until then, the safest thing is to change your oil regularly.

"Of course, you can check it to some extent by watching your oil pressure gage. If the reading drops down to about half of what it was when you put in new oil, it's a fairly good sign that the oil is getting thin."

"Aside from dilution, why is it that some cars use more oil than others?" interrupted

Messler.

"In most cases," advised Gus, "it's just a little reminder that the motor ba't running as well as it should. Of course, every motor is bound to use some oil, but when adding oil gets to be a habit, look for trouble. Bad bearings, loose-fitting piston rings, sprung connecting rods, and worn or scored cylinders are just some of the faults that show up in the oil hogs. Then there are leaks of all sorts.

HE way you drive has a lot to do with how much oil a car uses," went on Gus. "A motor that's running at high speed or up long pulls is bound to heat up. Naturally, the oil will get thinner and weaker. Hot, thin oil not only leaks easier but it's bad for the bearings. It pits the Bubbitt metal and makes it crumble. That's why some of the new cars are fitted with oil coolers. The oil is water-cooled.

"Then log, the faster you drive, the faster your oil pump will work and the pressure of the oil will increase. High oil pressure will force more oil into your cylinders and possibly through the bearings."

"Say, listen," grinned Messler, "Refore you think of any more troubles, what's to be

done with my car?"

"Well," Gus drawled, "you could get by with those rings for a while as long as the breather is open and the crankcase is ventilated. But to make a good job of it, I'd suggest new rings and a recondition job on

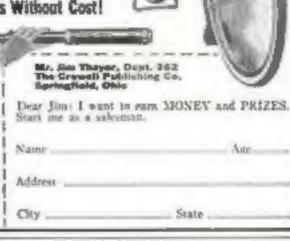
the cylinders."

"Phew I" sighed Messler, "The way you were going at it a few minutes ago I expected nothing less than the advice that I get a new motor. Well, give her the works, Gus. Might as well have it done now as later on when things may get worse. Besides I may be able to save a little on oil."

# WIN THIS BICYCLE

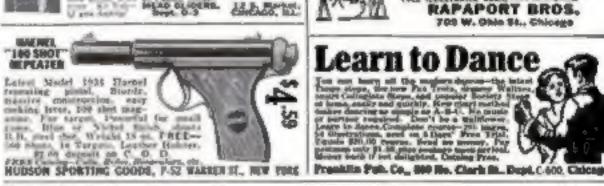
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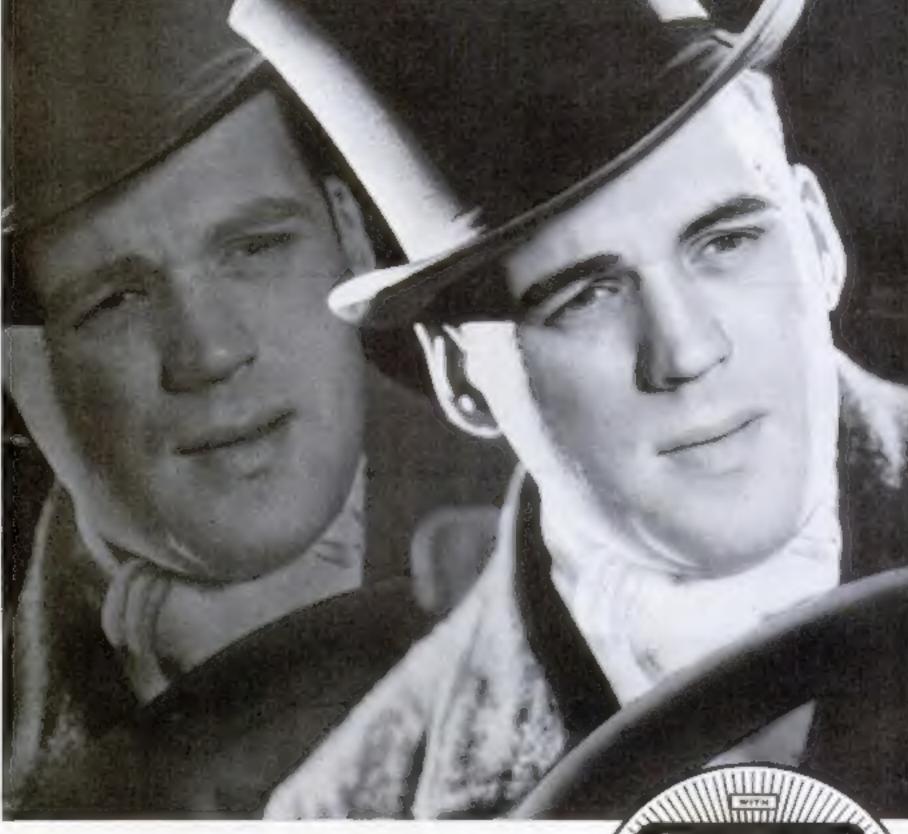


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# How Are Your Nerves?

Fortunate indeed is that modern man or women who does not get nervously upset. Raw, jangled nerves mem, all too often, to be the order of the day.

If nerves are your problem, we sufgest a check-up now-on your cating, sleeping, and smoking. Get a fresh slant on your smoking by changing to Camela. Much is heard about the

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